Engineering and Mining Journal

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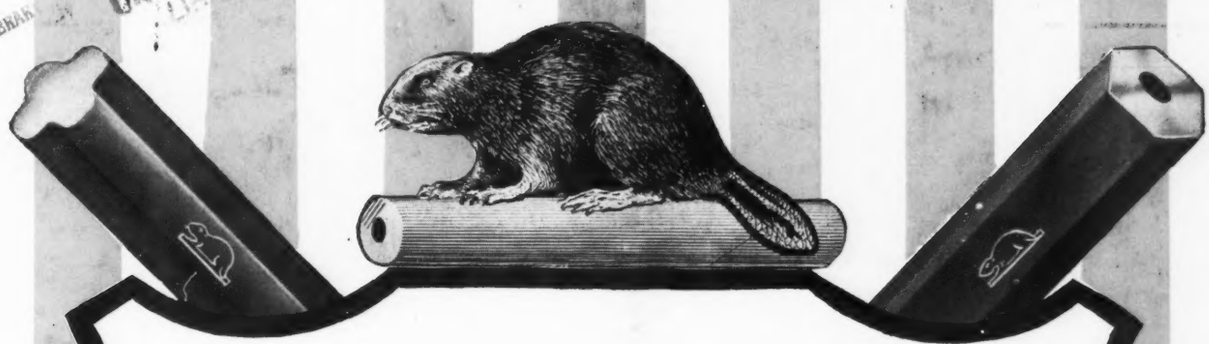

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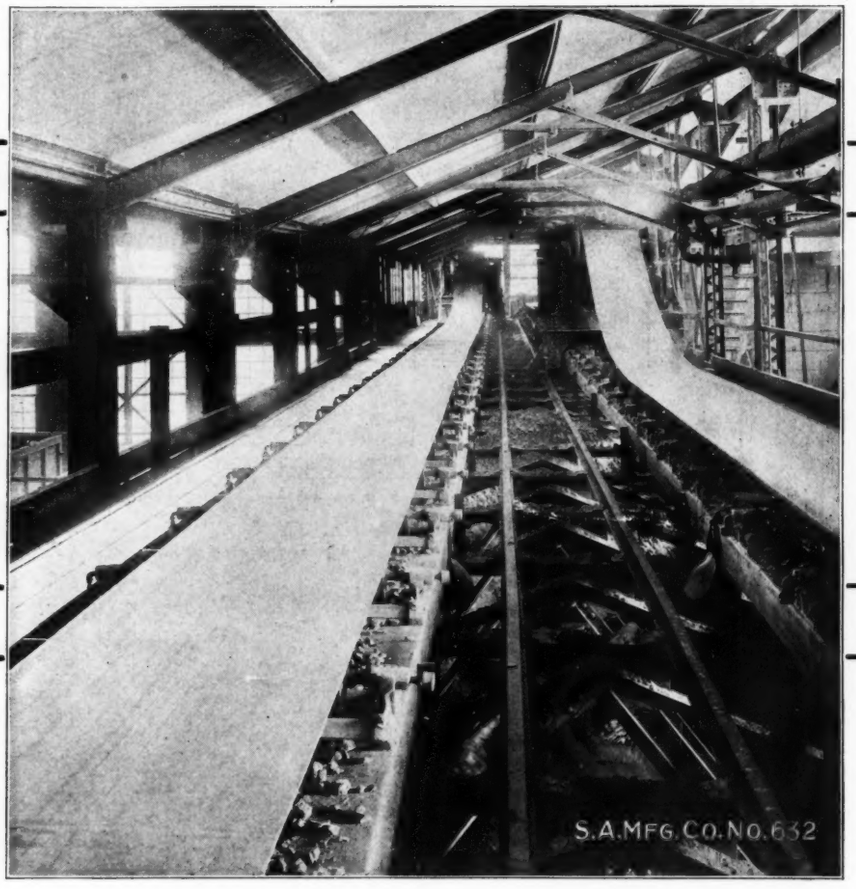

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HEADQUARTERS OFFICE OF THE OLIVER IRON MINING CO., HIBBING, MINNESOTA

Steam-Shovel Mining on Mesabi Range—III*

By L. D. DAVENPORT†

The track arrangement of an open-pit consists of a series of switchbacks or of a spiral, and grades seldom exceeed 1½%, although this is increased toward the latter life of the pit. Ore banks are drilled and blasted in advance of the shovel, and progress has been made in the use of air drills for this work. Hard and lumpy ore is screened and crushed by mechanical means, and hand sorting methods are general. Operators have followed the lead of underground mines in the installation of safety and sanitary devices, and the men are systematically trained in first aid.

IT IS customary to estimate each month the stripping yardage removed. The field work is done by cross-sectioning the excavation, usually at 20- or 40-ft. intervals. Lines of stakes are set and levels are taken on the sections, or the stadia method is employed. The former method takes more time in the field and requires a larger crew, but is more accurate when the cuts are irregular. With the stadia method, points are taken at the breaks in the surface of the cuts at regular intervals. The rodman chooses points along the cuts in such a way that, when platted on the map, they form lines of points across the cuts at about 40-ft. intervals.

The notes are reduced with a stadia slide rule and platted with a protractor on a map or stadia chart. Corresponding points are connected with lines as shown in Fig. 1, and the cross-sections are platted from the chart. With both methods, the sections are usually platted 1 in. = 20 ft. horizontally and 1 in. = 10 ft. vertically on 20-in. rolls cross-sectioned 10 x 10 to the inch. Areas are determined with a planimeter. With the stadia method, it is good practice to stake out the pit twice a year and take a "final estimate" to check the monthly work. Frequently so-called "operting maps" which show the various cuts, location of the shovels and loading tracks are made each month. These maps are made with the coördinate lines, drill holes, property lines, stripping limits and other permanent data inked in on the smooth side of tracing cloth. The

*Third and last of a series of articles, earlier installments of which appeared in the "Engineering and Mining Journal" Mar. 2 and Mar. 16, 1918.

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stripping banks, tracks and other data subject to change from month to month are put on the rough side in pencil and blueprints are furnished to the superintendent and various foremen.

Open-Pit Using Three Steam Shovels Requires a Crew of from 175 to 200 Men

An organization for a three-shovel stripping job would consist of a superintendent, one mining engineer and two helpers, one pit foreman, two shift foremen, a drill foreman, who has charge of 12 "gopher"-hole men; six "gopher"-hole loaders, and, for winter work, 50 to 60 drillers and four to six powder men; two track foremen, each with a gang of 12 men; one pipeman and helper, and the steam-shovel crew for each shovel, which consists of one steam-shovel engineer, one craner, one fireman and six pitmen. Sometimes only four pitmen are used, in which case the track gang lift and loosen the loading track, tamp the ties under the rails and clean off all spill from the cars. This work is done at odd times, frequently between 6 and 7 a.m. or p.m. when the shovel is not working, or, in the winter, during the noon hour. Each locomotive requires a crew consisting of one engineer, one fireman and one brakeman. On some stripping jobs instead of providing each train with a brakeman, one is stationed at each shovel to "spot" or place the cars at the right position for loading at the proper time. Switchmen are stationed at the few switches that have to be thrown along the main stripping track. When ore is being removed a brakeman is usually provided on each train.

Repair Work Makes Shop Help Necessary

The use of steel stripping-cars makes necessary an inspector with one or two helpers, who oil the cars and do light repairing and tinkering, while other repair work is done at the shops. The wrecking crane usually requires but one man, as the operator does his own firing. Coal dock, salt tank and sand house can frequently be so placed that one man can look after them all, with occasional help for screening sand, although when a coaling device is used two men are required to handle the coal. The pumping and power plants each require one fireman. Labor required for the shops consists of a master mechanic, who also acts as shop foreman; two mechanics, two helpers, two blacksmiths, one pipeman and helper, one head carpenter, who also acts as surface boss; one carpenter and one "wood butcher" (for rough repair work). A mine clerk, who also acts as supply clerk, and two timekeepers constitute the office force. Two teamsters are usually employed at the barn.

Final Track Alignment Spiral or Switchback

There are two principal arrangements for the ultimate track layout, namely, a series of switchbacks and the spiral track. For narrow pits, switchbacks are generally the practice, while a spiral track arrangement is used in pits more nearly circular in outline. Aside from the shape of the pit, its size, the depth of ore and the occurrence of "horses of taconite" are important factors in determining the alignment of the final track system. Often a combination of the spiral track and switchbacks is used, but whatever arrangement is agreed upon, the fundamental idea is to secure the method that will defer the removal of the least possible tonnage of ore in track benches. For any one season the final approach tracks are usually extended to the working level of the pit, and from this point on the tracks are put in according to the operating plans for that season. It is usually "up to the engineer" to see that the grade for the ultimate track is not cut into during a busy season. In the larger pits it is often possible to arrange the tracks so that the empty trains can be switched into loading position at the shovels as loads are removed in opposite direction.

GENERAL VIEW OF TRACKAGE SYSTEM—MESABI OPEN-PIT MINE

In good practice, main line tracks are carefully graded and aligned and do not exceed a 1½% compensated grade. Under these conditions a locomotive with a steam cylinder 19 x 26 in. will haul 10 loaded cars, or an ore tonnage of about 460. For the final clean-up of a pit, the grade is sometimes increased up to 3%. A common practice is to use "grade boards" at each shovel, so that the loading tracks are fairly uniform in gradient. In some cases grades as high as 6% have been used for short distances and two locomotives were required to haul out one car of ore. The grade boards used in the Mesabi district are made from 1 x 6 in. pine or fir and 10 ft. long. A small carpenter level such as retails for 10 or 15c. is used with each board. The engineer sets a track spike at grade on the ore between the shovel track and the jack block. Before the shovel is moved up, the pit crew places one end of the board on the spike and, using the level, sets another spike 10 ft. ahead. If the shovel is to cut at a grade, a block is nailed to the front end of the board for a down grade and to the rear end when cutting on an up grade, using proportionate measurements to secure required grades, as, for instance, 0.01 ft. for a 1% and 0.15 ft. for a 1.5% grade. The pitmen, under the direction of the craner, soon become expert in the use of this device, and shovels frequently work for two or three shifts with a variation of only a few hundredths in gradient. With the proper use of the grade board, little hand grading is necessary in laying a track in the cut. A small amount of loose ore is usually required for the difference in the height of the ties.

Ore Banks Are Blasted After Being Jump-Drilled

In most open-pit mines, it is customary to blast the ore banks ahead of the shovels. Top holes are used for this purpose, excepting where there is a rock capping over the ore. In the latter case "gopher" holes are drilled. Top holes are "jumped" or churned by gangs of drillers working in pairs. The drills are made of 1-in. round or hexagonal steel and chisel pointed on both ends. The heavy iron cross-handle or yoke used with these drills is shown in Fig. 2.

The spacing of the holes depends on the hardness of the ore, the height of the bank and the width of the cut to be taken. In average ore with banks from 15 to 25 ft. high, the holes are usually spaced 20 to 24 ft. apart and about 20 ft. from the crest of the bank. It is desirable to have the holes bottomed a foot or two below the cut to be taken. That is, with a 15-ft. bank, a 15- or 17-ft. hole will shake the ore to the full depth of the cut, so that there will be no "tight" ore remaining for the shovel to dig. It is not always possible to jump top-holes down as deep as they should be, because 22 ft. is the limiting depth with hand jumping. In average ground a 15-ft. top-hole, when finished, would be sprung or chambered with two to six sticks of 60% dynamite, then loaded with black powder and fired. If several holes of this depth were to be blasted in series, the charge would consist of one to one and one-half 25-lb. kegs of black powder. If the holes are to be exploded separately, as is sometimes necessary when the bank is high and the loading track is close in to the toe, the charge should be slightly increased. Top-holes are usually fired in series of not more than five at a time, using a blasting machine. In some cases, safety regulations require that holes be fired separately.

A number of mining companies are using machine drills for top-holes, instead of driving them by jump-drills. The use of air machines in large open-pits necessitates either the building of a compressor plant and extending pipe lines through the pit or equipping each shovel with a compound air pump. The latter arrangement does away with the shifting of pipe lines as the benches are worked back, and eliminates any trouble incident to the freezing of air lines. Furthermore, an individual air pump is advantageous, when the shovel is moved from ore to stripping, in that it can furnish power to operate Jackhamer drills for block-holing boulders, obviating the necessity of using hand drills. A gang of jump-drillers will average 50 ft. of hole per man per day in ore. With the D 113 Ingersoll-Rand drill an average of 90 ft. per shift has been made in the Mesabi district to date. This footage is equivalent to 45 ft. per man per day, as two men are required in the operation of the drill. However, good jump-drillers are hard to find, and, where rock is encountered in the ore, hand jump-drilling is of little or no advantage, whereas the machines drill the rock seams readily. As already stated, 22 ft. is the limiting depth for hand jump-drilling, but 28 ft. holes have been drilled with the D 113 machine, and present operations seem to indicate that holes as deep as 30 ft. will offer no difficulties.

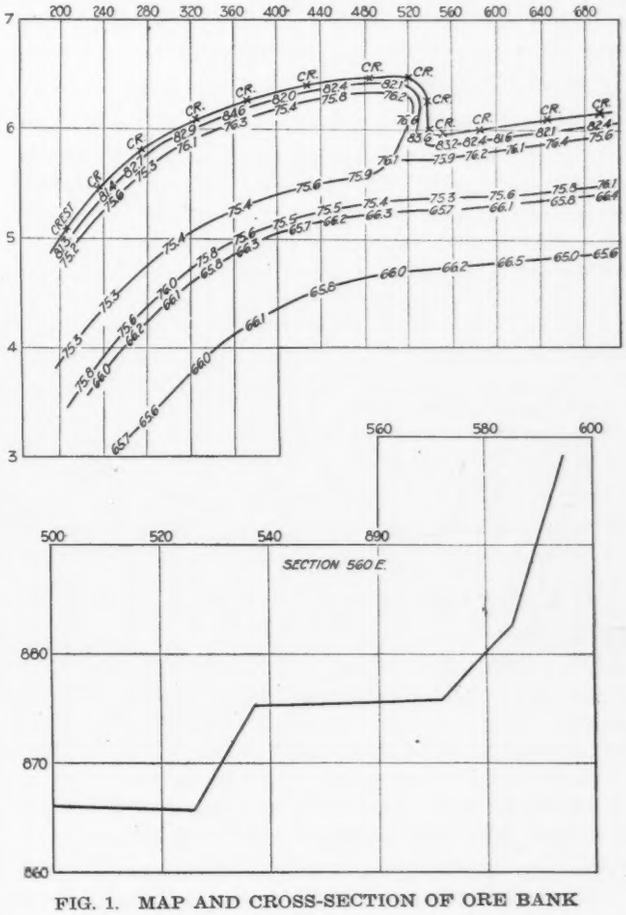

FIG. 1. MAP AND CROSS-SECTION OF ORE BANK

In many cases the exploration drill holes through the open-pit orebodies were put down from 300 to 400 ft. apart. As the ore pits are developed it frequently becomes necessary to secure more detailed information

than is shown by the exploratory drilling. To supplement this data, at many of the mines test pits are sunk at 100-ft. intervals in the ore, usually after the shipping season has closed. The pits are 2 x 4 ft. in cross-section, seldom require any cribbing and, when possible, are excavated to 50 ft., as this depth corresponds to the height of two benches or cuts in the pit. Analyses are made of samples taken every five feet, and the results platted on cross-sections. These test-pit cross-sections are used in conjunction with the operating maps to estimate tonnage and analysis of various grades or "groups" of ore for the guaranteed shipments of the next season. Some of the mining companies put down churn drill holes instead of test pits. Churn drill holes can be sunk faster than test pits, but the samples from the latter are more accurate than the results from churn drilling, especially in sandy ore. Furthermore, test pits offer an opportunity to observe the color, structure and dip of the ore layers.

Hard Lump Ore Crushed Before Shipment

In a number of the open-pit mines on the Mesabi, certain ore-bearing materials are encountered in the deposits that cause serious delay in steam-shovel work. Among these may be mentioned "crushing ore," which contains a large proportion of hard chunks or lumps,

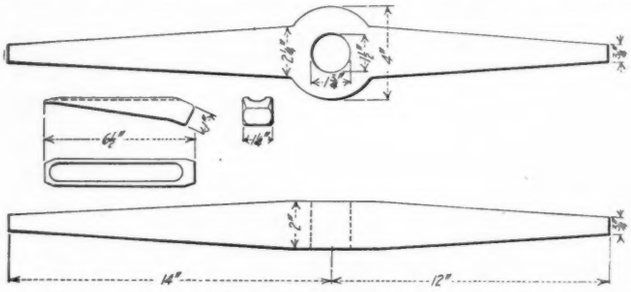

FIG. 2. YOKE OR CROSS-HANDLE USED WITH JUMP DRILLS

and "screening ore," which contains a large percentage of broken taconite. The "crushing ore" is either block-holed or sledged by hand to reduce it to the proper size for shipment. At the Biwabik mine, Biwabik, lump ore is loaded into stripping cars and hauled to a No. 24 Allis-Chalmers gyratory crusher, which reduces any lump that will pass through a three-yard dipper.

Hand and Mechanical Sorting Methods Separate Ore from Taconite

Screening ore in many cases is hand sorted, that is, the broken taconite is picked out by hand and loaded into dump cars and the fine material shipped as ore. At the Susquehanna mine, Hibbing, screening ore is loaded into stripping cars and sent to a cylindrical, revolving screen, 5 ft. in diameter and 24 ft. long and perforated with 2½-in. holes. The oversize from the screen is sent to the rock dump and the fines are shipped in ore cars. At the Mace No. 2 mine, Hibbing, the broken taconite and ore are dumped on a grizzly built of three sets of 80-lb. rails spaced from 8 to 10 in. apart. The rock goes over the grizzly to stripping cars and the fines go to ore cars.

Fig. 3 is a cross-section showing the relative position of benches that was maintained in sorting rock from ore at the Graham mine, Mesabi, on the eastern end of the range. The screening material was dumped from the upper bench and most of the rock rolled to the toe of the bank. Any rock remaining on the slope was pulled down by men using potato diggers. The rock was then loaded into wheelbarrows and transferred to rock cars on the third bench. The track on the upper bench was shifted over as the width of the ore pile increased. When a sufficient tonnage of cleaned ore had thus been stockpiled, a steam shovel was used to load the pile. It is advisable to install a crushing or screening plant where a large tonnage of ore will respond to the treatment furnished, as the accompanying delays to steam shovel and locomotive crews when ore chunks are being sledged or rock sorted out are expensive.

Factors That Determine Tonnage Loaded by a Steam Shovel

The tonnage that can be loaded with a steam shovel depends on many factors, among which are: Size of the shovel, capacity of the dipper, skill of the engineer and craner, height of the bank and length of the cut, structure of the ore, train service to shovel, amount of rock or chunks in the ore, and weather conditions. With the dippers in proportion to the size of the shovels, a Model 91 will load more ore per shaft than a Model 60 shovel under the same conditions. One mining company equipped some of its Model 91 shovels with 4 cu. yd. dippers in place of the 2½ cu.yd. dippers previously used. The increased tonnage loaded was well over 30 per cent.

The height of the bank affects the rate of loading, and with a high bank more ore can be loaded per "shovel move" than with a low bank. Each move, usually six feet, requires from two to six minutes. It is often possible to move the shovel between train loads and thus decrease the delay. Furthermore, when a shovel is working in a 25- to 30-ft. bank, the pit crew has time to carry the ties and track section to the front end of the shovel before it completes the cut from that portion, thus decreasing the time required for moving. With a low bank, the pit crew does not have time to do this work before the shovel stops loading.

There is considerable delay when a shovel has finished a cut and has to be moved back for a new cut. After a track has been laid in the excavation behind the shovel and the shovel has been moved back off the sections, the old loading track must be broken, thrown over and connected with the track just laid. At the other end of the cut, after the shovel has been moved on to the sections again to begin a new cut, similar connections must be made between the old and new loading tracks. This track work is usually the greatest cause of delay in moving back, and the same track work is necessary if the distance moved is 500 ft. or 2500 ft. Therefore the longer the shovel cut the less delay each season in moving back the shovel.

Supply of Cars to Shovels Essential to Continuous Operation of Pit

Train service to the shovels depends on the number of locomotives available, the length of the haul to the yards, track arrangements and the supply of empty cars furnished by the railroad company. The supply of empties depends on the regularity of the ore-boat schedule. When bad weather or other causes delay the ore boats, there is a congestion of loaded ore cars at

the docks at the head of the Lakes, and the pits are forced to lie idle or work on a reduced scale until the arrival of ore freighters relieves the situation.

The ideal track arrangement is one where the empty train drops into a loading position at the side of the shovel as the loaded train pulls out in the opposite direction. Such a layout is a sort of ladder track, where the empty or return track from the ore yards branches into a number of loading tracks, one for each shovel. At the opposite end of the pit these tracks converge into a single track connected to the main load track out of the pit. Obviously, this arrangement can be used only in the larger pits, and a more common layout has a passing track for each shovel. These passing tracks can frequently be used for several cuts, depending on the width of the ore bench, the number of shovels operated and other local conditions. If conditions are such that a passing track is not feasible, a "lie by," or sub-track, is sometimes built, just long enough to hold an empty train while the loaded train passes by. The fundamental idea in any of these track arrangements is to keep the shovels supplied with empty cars with the least possible delay.

The structure of the ore has a direct bearing on the rate of loading. Some ore banks after blasting are

FIG. 3. RELATION OF BENCHES IN ORE-SORTING PLANT

thoroughly broken into small fragments, and such ore is easily and quickly loaded. In other banks, the ore may be tough and in blasting "break big," in which case the shovel has to spend considerable time in "clawing" the bank in order to bring it down.

Safety Measures Adopted by All Operators

During the last few years considerable interest has been taken by the larger mining companies in safety work. Thousands of dollars have been spent and considerable time and thought given toward making both open-pit and underground mining as safe as possible for every man engaged therein. It is not within the scope of this article to give even an outline of the rules or "safety regulations" which every foreman is required to know, understand and put into practice. Furthermore, each man is urged to consider himself a committee of safety, and by this coördination many rules and devices have been improved and perfected. Frequent inspection trips are taken through all the mine workings by the safety engineer and by committees composed of workmen. These committees are changed from time to time, and the recommendations offered in their reports are usually adopted, or, if not, adequate reasons must be given.

Hundreds of men are trained each year in First Aid work by the safety engineer and by First Aid miners from the mine-rescue cars sent out by the Government Bureau of Mines. Numerous lectures have been given by physicians, not only on First Aid, but on elementary personal hygiene and sanitation as well. The general interest aroused has done much to eliminate accidents caused by personal carelessness, and the general knowledge of First Aid possessed by the men has many times prevented minor injuries from developing seriously.

It has been the purpose of these articles to describe the present practice of the larger mining companies in developing and operating open-pit mines on the Mesabi range. The papers make no pretense to being an exhaustive treatise on open-pit mining, but are designed to outline with some detail the various operations in steam-shovel mining, and, in general, to answer the principal questions asked by the various mining men who visited the district. The writer wishes to take this opportunity to thank Mr. Fred R. Mott, superintendent of the Oliver Iron Mining Co.'s Hull-Rust mine, for his many helpful suggestions and detailed explanations.

Conclusiveness of Department Findings

By A. L. H. Street*

The decision of the United States Supreme Court lately handed down in the case of Kirk vs. Olson, 38 *Supreme Court Reporter*, 114, disposed of a controversy over a land title, arising from conflicting homestead and placer mining claims. The court holds that a finding by the Land Department at Washington that the tract involved was valuable for placer mining, the finding being made on one-sided proof submitted to the department in support of a placer entry, was not so far final and conclusive as to preclude reconsideration of the question and reversal of the decision before issuance of a patent. But both of two joint claimants of the placer entry were entitled to notice of intention on the part of the Land Department to reconsider the question as to the character of the land, and where one of them was not so notified he was not precluded by the Land Department's subsequent finding, that the land was nonmineral in character, from showing in a suit by one who acquired a patent to the tract under the homestead laws, brought to quiet title, that the land was in fact valuable for placer mining. Yet this failure to give such notice does not affect the homestead patentee's right to a decree quieting title, on it being proved, in a suit to which the interested persons were made parties, that the land was strictly agricultural, and therefore not subject to entry or acquisition under the placer mining law.

Hongkong Metal Trade

Hongkong is stated by Consul General George E. Anderson, in *Commerce Reports*, to be the distributing point for practically all metals sold in China, Indo-China, the Philippines, Formosa, the South Seas, Siberia and other parts of the Far East. Of late it has also been the distributing center for metal supplies imported from Europe and the United States for Japan. On the other hand, tin, antimony, wolframite and other metals and minerals from China and the Far East find much of their market through Hongkong. The great feature of this trade for the last year has been the increasing dependence upon the United States, both for imports and exports.

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Cement Gun in Mining Work—*I

By GEORGE S. RICE
Chief mining engineer, Bureau of Mines, Pittsburgh, Penn.

The paper presents a partial history of the early use of concrete and cement grout in mines and of the introduction of the cement gun. Its use in the experimental mine. A description of the gun and its manner of operation and an account of results obtained in recent tests of the gunite.

THE use underground of hydraulic cement and the scope of its uses increased almost as rapidly as in surface construction. One of the early underground applications was for the filling of the cavities behind the linings of tunnels, this being accomplished by pumping cement grout into the open spaces. In France in later years the "cementation process" of impregnating broken water-bearing ground by forcing in cement under high pressure was successfully employed, revolutionizing the method of shaft sinking through water-bearing chalks and marls in the north of France and Belgium. The employment of concrete for making massive linings of shafts and tunnels in place of timber framing and brick arching has been very extensive. The development of thinner, reinforced lining came into use later. In 1906 I waterproofed the air shaft of a mine in central Illinois by placing a thin but reinforced concrete lining, rectangular in section, inside a wood cribbing. The shaft passed through water-bearing ground.

About 1907 one of the large colliery companies of northern France, Mines de Béthune, began, in a new colliery, the use of a light, reinforced-concrete lining for all its cross-strata tunnels. When I visited this colliery in 1908, two miles of this lining had been constructed. It was only 5 or 6 in. thick, and the mixture was lean. Moreover the reinforcement was so very light that the cement work seemed to be hardly more than self-supporting and probably bore little of the weight of the encompassing strata. In other words, it apparently served merely to protect the strata from weathering.

The lining served its purpose satisfactorily, as I found out when I again inspected it three years later (1911), by which time more lining had been built. On the other hand, timbered tunnels in the same formation had given much trouble. This demonstration convinced me that the important factor was to protect the strata from the action of the air. The cost of the lining in the Béthune mine was relatively low under the conditions then prevailing in France, only $5 per lineal yard, which figure would have to be doubled if an estimate were to be made of the cost of such lining in this country, even prior to the war. The general method of lining seems an admirable one, although the first cost was considerable, but, in the long run, it should be economical because it eliminates the cost of timbering and of cleaning up of falls of roof inseparable from the maintenance of a roadway and it also serves as a protection for the men against injury from roof and rib falls.

Concluding that the protection of the natural roof and ribs against weathering, a process for which oxidation is principally responsible, was probably the important factor in preventing subsequent falls, I studied the problem carefully in the hope of determining what sort of inexpensive coating might be applied to a shale roof to prevent its coming in contact with the air currents, with the hope of thereby saving expensive work later on, and, furthermore, of lessening accidents from falls.

In many mines, when the mine entries are first driven, the top or bony coal roof seems admirable. It appears as if it would stand forever; but in a year or even less the weathering action begins, falls occur and timbering and retimbering follow. Finally you find the roof has dropped until the entry is twice as high as it was originally, and more or less filled with timber. When this condition has to be met it involves a great annual expense for the maintenance of the roads, and should a fire start there is plenty of fuel to feed it. Also the timbers provide places for the lodgment of the dangerous coal dust which floats in the air. In this manner timbering increases the explosion hazard.

In 1910, when I saw the cement gun exhibited at the convention of the National Association of Cement Users, held in New York, I thought that here was an apparatus that would furnish the agency I sought for the placing of a more or less impervious coating on the mine walls. I made reference to its availability for that purpose in an address on concrete in mining (which appeared in the transactions of the 7th convention in 1911). After showing how much safer was a smooth, concrete lining as compared with timbering, I made the following statement, which appears to be as true now as then:

"The apparatus for applying cement mortar by means of compressed air, commonly known as the 'Cement Gun,' offers great possibilities for the lining of passageways, etc., with cement. By protecting from weathering the roof and walls of a passageway with a thin coating of cement, it is possible that the heavy expense of timbering in many cases may be avoided. The machine also offers possibilities of use in the fireproofing of timber and board stoppings and in the erection of firewalls in places difficult of access, since the material can be pumped for a considerable distance."

For many years grout has been pumped into cavities behind tunnel and shaft linings. However, G. L. Prentiss, in a paper given at the meeting of the cement users above referred to, on the "Use of Compressed Air in Handling Mortars and Concrete," stated that compressed air was first used for the transporting agent in placing concrete and mortar in France, for the repairing of tunnels on the Paris-Lyons-Mediterranean Ry., France. This was in 1906. The linings of

*Paper read before the Coal Mining Institute of America at its Pittsburgh, Penn., meeting, Dec. 6, 1917, and entitled "Weatherproofing Mine Roof and Walls and Making Tight Stoppings with Cement Gun." Reprinted from "Coal Age."

the tunnels were leaking and the arches were thereby becoming weakened. The engineers attacked the problem by using a machine consisting of a charging hopper connected with a pressure tank, into which air was forced by a compressor at a pressure of 40 to 50 lb. per sq.in. The tank was first charged with a grout composed of cement, sand and water, and after the pressure had been put on the material was forced out through a line of flexible hose to a discharge nozzle, which was applied to holes drilled through the arch of the tunnel. It is stated the results from an engineering standpoint were satisfactory, but the machine gave trouble, as it and the hose became clogged with grout, and the process was therefore tedious and expensive.

Various other attempts were made to use compressed air for blowing cement or concrete mixtures through pipes, and according to Mr. Prentiss, J. W. Buzzell and W. H. Larkin, in 1909, undertook work in this country as 1910. The method was used for applying stucco and cement-sand mixtures; thus it was used for coating a frame building with stucco. Brick walls and fences were by this means covered with stucco or cement. He also instanced its use in the construction of the General Cement Products Co.'s buildings; the coating of structural steel, with and without the addition of reinforcing wire mesh; the fireproofing of the interior of wood-lined buildings; the building up of sections of cement pipe from a wire-mesh skeleton; the use for tree surgery; and the very important application of lining the iron syphons in the water supply system of New York. These syphons were 11 ft. 3 in. in diameter, and the total length to be treated was nearly 14,000 feet.

In that same 1910 meeting there was some talk of using the cement gun in mines, but it was with the idea of pumping concrete or cement into an excavation and filling it solid. In this manner it was suggested that a

FIG. 1. THE MACHINE BEHIND THE GUN

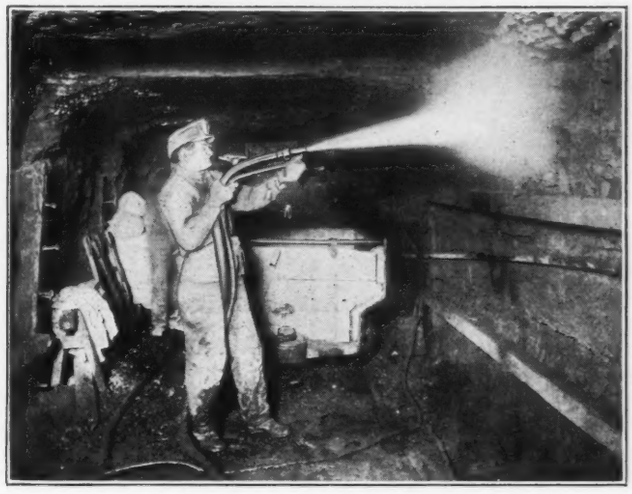


FIG. 2. THE MAN BEHIND THE GUN

of that nature. They found that they could force a mixed concrete through a 4-in. pipe a distance of 400 ft. with a pressure of 40 to 50 lb. per sq.in., a higher pressure than this not being found advantageous.

The predecessor of the cement gun appears to be the long-used spraying device employed for the painting and whitewashing of rough work, like railroad freight cars. Here the paint or whitewash is ejected from a nozzle by means of compressed air. Nevertheless, this method, like those previously described, used the compressed air to transport the grouting, concrete, or whitewash in liquid mixture, whereas the cement gun operates on a different principle; namely, to transport the cement and sand dry, wetting it only at the nozzle. It is not, of course, possible to employ crushed stone in the mixture, which must be composed of cement and sand only.

As the cement gun is a patented machine, I feel it is necessary to explain that I have never had any financial interest in it, and that I am concerned in it only as a means of obtaining a certain practical result in the mines.

Mr. Prentiss described in the paper, to which I have just referred, a variety of applications of compressed air to the placing of cement mixtures, some as early deposit of cement mortar might be placed which would later serve as a pillar. Men not familiar with mining thought that as concrete was so much stronger in compression than coal, no coal pillars would be required, if much smaller concrete pillars were substituted. Manifestly with the ordinary roof or floor the concrete blocks would be pushed into the roof or floor before the full strength of the concrete was developed, or else the roof spanning the excavated area would fail. So far as known, this futile project was never tried.

After seeing the demonstration of the gun in the exhibition of 1910, and the way the cement coating, sometimes termed "gunite," would stick to steel and stone, I concluded that here was a machine which offered a means of applying a thin cement coating to the roof and ribs of an entry or tunnel before weathering took place.

When the experimental mine of the United States Bureau of Mines, located near Bruceton, Penn., had been fully developed for its purposes, a cement gun was loaned in 1914 to the bureau by the Cement Gun Co., for trial applications. The manufacturers at that time, not having turned their attention to its mining possibilities, could not be induced to lend the gun without considerable negotiation. It was found, after ex-

perience had been gained in handling the gun, that a cement-sand covering, varying from a thin coating to one several inches thick, as desired, could be placed without difficulty on the coal ribs. It would even stick to the "draw slate" or clay band. Moreover, a thin to a ¾-in. coating could be made to stick to the roof without the use of wire mesh.

It was also found to be of great advantage in making stoppings practically air-tight. In October, 1914, when the American Institute of Mining Engineers met at Pittsburgh, an exhibit was given at the mine of the use of the cement gun for these purposes. The cement-sand lining has been extended in the mine entries from time to time until now nearly 1000 lin.ft. of entry has been thus lined, the roof coating being from ¼ to ¾ in. thick and the rib covering from 1 to 2 in. thick.

These coatings have been found very successful in the prevention of weathering on the sides and roof. It is true that from time to time repairs have had to be made on the roof coating, but this, in part at least, seems to have been due to the effect of the violent explosions produced in our experiments, of which over three hundred have been conducted. After many of these the coating would shell off the roof in patches, particularly where a void had developed behind the coating. These voids, or spaces, are caused by the concrete shell pulling away from the main roof where it is shaly, taking some scale with it. The concussion or rush of the explosive blast later knocks off the shell.

Gunite Withstood All Except Explosions

In offsets, where the work is protected from the explosions, the coating has rarely come off. As a result of these experiments it was thought that if the coating was well put on, particularly when the roof was fresh and sound, it would stick tight for a long period under ordinary mine conditions. Since the conditions at the experimental mine were abnormal, the failures in patches of the roof cannot be considered to condemn the system and there has been no trouble whatsoever from the coating on the ribs and draw-slate. This is most important, as those who have operated in the Pittsburgh beds well know. Usually disintegration which leads to falls in the roof comes about through draw-slate over the coal softening, thereby widening the roof span. Then the roof falls and the widening and cutting back goes on, making the timbering more and more expensive.

These tests at the experimental mine were brought to the attention of leading mining men, and this caused some of them to try experiments of their own. Trial of the method was made slowly at first, but the representatives of the bureau constantly urged further experiments as the change seemed to promise increased safety as a result of better lighting, the reduction of falls and the danger of coal dust explosion propagation. Now the development is proceeding more rapidly.

Fortunately the cement gun can be used for other purposes than to prevent the weathering of the mine roof. For example, it can be used in the fireproofing of wooden stoppings, the sealing off tightly of fires, something which much appealed to the metal mining companies, operating large bodies of rich sulphide ores, which are prone to spontaneous combustion in stopes. The cement gun is also most useful wherever iron or steel beams or posts are employed underground or in shafts, as it prevents the metal from rusting.

An excellent description of the cement gun was presented by Carl Weber in a paper before the Western Society of Engineers on Mar. 9, 1914. It described the gun as it appeared in earlier stages of its development. A good description also appeared in *Engineering* (London) for June, 1916. These articles show the remarkably wide adaptability of the cement gun to other uses than those already mentioned, such as the repairing of concrete walls in subways, the rehabilitation of retaining walls, the lining of reservoirs, the repairing of street-car tunnels and the lining of coal bunkers.

The cement gun (see outline drawing) consists of two hoppers, an upper and a lower one, the upper one being the receiving hopper for the mixture of sand and cement. This mixture is made on the ground and shoveled into the hopper in a dry state. The receiver has a cone stopper in the top and one for the discharge of material from the bottom, thus the feeding material is "air locked" into the lower hopper which is

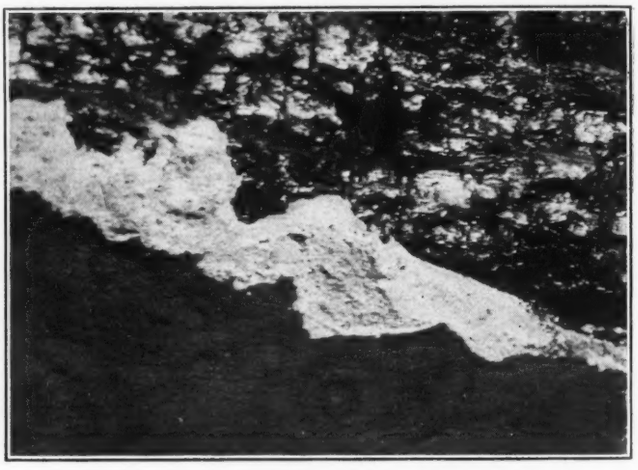


FIG. 3. SHOWING THE GUNITE PICKED DOWN
The gunite adheres closely to the coal surface

under air pressure of from 20 to 50 lb. In the bottom of this hopper there is a feeding wheel, which is turned mechanically. As it revolves, it delivers the right quantity of cement material opposite the outlet. Here the pressure of the air in the lower hopper forces the measured material out. As the dry mixture is forced into the flexible hose, additional air is injected and this aids in carrying the material onward to the nozzle. The hose may be of considerable length—50 or 100 ft. or even more. At the end of the discharge tube there is a nozzle where water is supplied at a pressure about 20 lb. per sq.in. higher than the pressure of the air. This is delivered in such a manner that it immediately mixes with the sand and cement. The nozzle is handled like a water hose and pointed approximately at right angles to the wall or surface to be covered. The sand is mixed with the cement in proportion of 3 to 1, but about 20 to 25 per cent. of the sand, after impinging on the wall, drops to the floor, so that the coating put on is about 2½ to 1. The surplus sand can be shoveled up and used again. It is surprisingly clean.

The wheel is turned by a worm which is driven by a small air motor. The compressed air and the water under pressure are usually furnished by the mine plant.

but if the mine is not equipped it would be necessary to have a portable compressor and also a pump with a supply of water for the operation of the cement gun.

A cross section of the machine is shown in Figs. 4, 5 and 6. *A* and *B* are cone valves operated by control lever *C* and *D*. *E* is the air-supply valve. The air-supply hose is connected at *F*. *G* is the supply cock for the air motor; *H*, an air pipe, controlled by cock *A*. The main air-supply pipe to the lower main hopper is controlled by the cock *K*. *L* is discharge tube of the machine and it is shown in Fig. 5 at *M*.

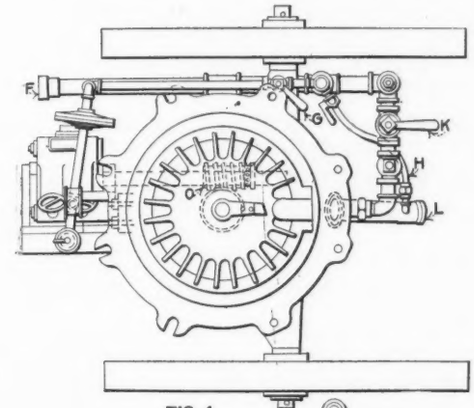


FIG. 4

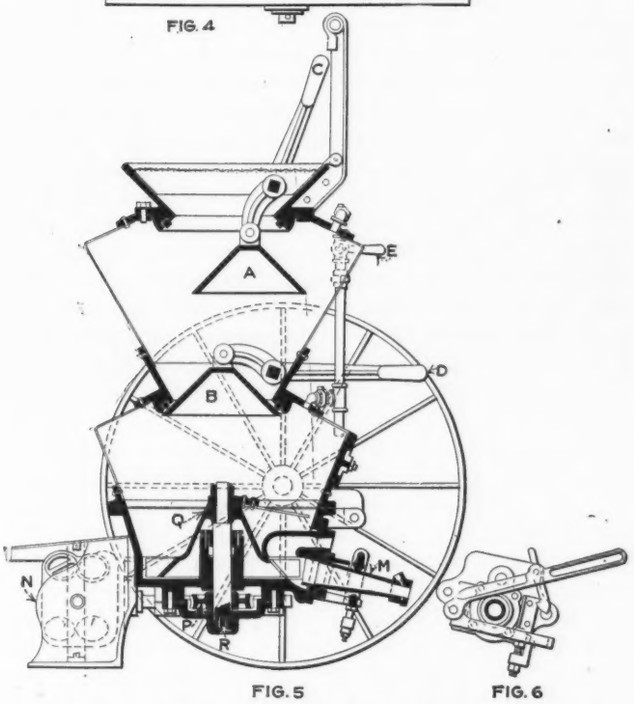


FIG. 5 FIG. 6

FIGS. 4, 5 AND 6. SECTIONAL PLAN, SECTIONAL ELEVATION AND DETAIL OF PINCHING LEVER

The tube is flexible and may be throttled by the pinching action of a lever shown in the small detail drawing, Fig. 6. *N* is the air motor and *O*, a worm, driving through gear *P*, the feed wheel *Q*. *R* is the footstep of the vertical shaft of the rotating wheel. It is to be noted that the discharge tube *L* is of rubber and the hose is rubber lined, there being no metal exposed to the sand blast except a little at the nozzle.

According to Mr. Weber, the sand-cement material leaves the nozzle with a velocity of about 300 ft. per second. In striking a hard surface the sand rebounds and falls down, only the neat cement adhering until a coat is formed thick enough to hold the sand. Then the rebound lessens and the coat is built up until the desired thickness has been obtained. The tightness by which the sand-cement coating is placed by this method is of great value. A report was made by Westinghouse, Church, Kerr & Co., testing engineers, which was quoted at length in the paper just referred to. It bears testimony to the quality of the cement-sand coating produced by the cement gun. Their conclusions were:

In all of the tests made the products of the cement gun were shown to be superior to good hand-made products of the same kind. The degree of superiority varied between wide limits.

In tensile strength the gun work excelled hand work in every case by amounts ranging from 20 to 260 per cent.

In compressive strength the excellence of the gun work was even more marked, ranging from 20 to 720 per cent. better than hand work.

In the matter of surface permeability the gun work absorbed from 7-10 down to 1-20 as much water per hour, per unit of area as the similar hand-made surfaces.

As regards absorption of water, the hand-made mortars took up from 1.4 to 5.3 times as much as the gun-made mortars.

The percentage of voids of the gun-made product ranged from 52 to 75 per cent. of that in the hand-made product.

The adhesion of the gun-applied mortars was on an average of 27 per cent. better than that of the hand work.

I will not attempt to take up at length the many uses other than those already cited for which the method may be employed, except to quote from Mr. Weber's paper that a large reinforced-concrete power house with a chimney 150 ft. high was coated with a thin gunite coating, the chimney receiving the same coating as that used on the building, thus providing a uniform finish for the entire structure. There was no difficulty experienced in shooting up the sand-cement mixture through the hose to the nozzle in working on the high chimney, with the gun standing on the ground level.

The foregoing description refers to a specific machine. There are other machines which are said to accomplish similar results, one called the "Concrete Atomizer." These machines use a different principle, forcing out a wet or liquid mixture with steam or compressed air. A concrete atomizer was employed, in 1914, on the Delaware, Lackawanna, & Western R.R., in the repair of honey-combed and cracked concrete piers, girders, beams and slabs. No doubt there are other workable machines, but I have only had experience with the cement gun. It is presumable that there be a great variety of forms which might meet the needs of the mining industry, but the essential requirement for that service is the delivery of the mixture under considerable pressure through a nozzle with a flexible hose which may be over 100 ft. long if desired.

(*To be continued*)

Mining Operations in Alaska in December were handicapped seriously by the cold weather, reports to Washington show. At Fairbanks, the average temperature for December was 41° below zero, according to official determination. There were 15 nights when the minimum temperature was below 50°. There were five days during the month when the maximum temperature was not above 40° below zero. Recorded temperatures are available only for 15 years, but last December's record showed the lowest registrations.

Remember the Comfort Fund of the 27th Engineers.

Preliminary Report on the Mineral Production of Canada for 1917

THE preliminary report on the mineral production of Canada for the calendar year 1917, by John McLeish, chief of the division of Mineral Resources and Statistics, has been issued by the Canadian Department of Mines, Eugene Haanel, director. There was an increase in the total value of the mineral products, but the quantities of many important items were considerably less in 1917 than 1916, and over two-thirds of the increase in value is to be attributed to coal, gypsum and cement, in which the quantities marketed were less than in the previous year. The interrelation of industry is shown by the effect of a diminished coal and coke output on the metallurgical production; the falling off in production of copper and gold is in part attributable to this cause. Lead and silver also show much smaller output. As against these decreases, there was an important increase in the production of zinc, and increases also in the production of cobalt, molybdenite, and nickel.

THE MINERAL PRODUCTION OF CANADA IN 1917
(SUBJECT TO REVISION)

	Quantity
Metallic:	
Antimony ore (exports), tons	(*a*) 774
Cobalt, metallic contained in oxide, etc., lb	1,089,134
Copper, lb	108,860,358
Gold, oz	747,366
Iron, pig from Canadian ore, tons	46,022
Iron ore sold for export, tons	169,192
Lead, lb	32,072,269
Molybdenite, lb	271,530
Nickel, lb	84,470,970
Platinum, oz	49½
Silver, oz	22,150,680
Zinc, lb	31,227,351
Non-Metallic:	
Actinolite, tons	120
Arsenic, white and arsenic in ore, tons	(*b*)
Asbestos, tons	144,185
Asbestic, tons	9,596
Barytes, tons	958
Chromite, tons	36,352
Coal, tons	14,015,588
Corundum, tons	188
Feldspar (not complete), tons	11,493
Fluorspar, tons	4,249
Graphite, tons	3,714
Grindstones, tons	2,279
Gypsum, tons	339,418
Magnesite, tons	58,090
Manganese, tons	158
Mica, tons	(*b*)
Mineral pigments: iron oxides, tons	9,372
Mineral water	(*b*)
Natural gas, M. cu.ft.	26,465,686
Petroleum, bbl.	205,332
Pyrites, tons	403,243
Quartz, tons	205,851
Salt, tons	138,909
Talc, tons	15,812

(*a*) Tons of 2,000 pounds. (*b*) Figures not available

COPPER

The production of copper in 1917 amounted to 108,860,358 lb., valued at $29,588,254, as against 117,150,028 lb., valued at $31,867,150, in 1916, a decrease of 7.08% in quantity and 7.15% in value. Though less than the 1916 output, the 1917 production was greater than any other previous record. The electrolytic copper refinery installed at Trail, B. C., began operations about Nov. 1, 1916, with a capacity of 10 tons of refined copper per day, which has been increased to 20 tons per day. Of the total 1917 production, 86,508,758 lb. was contained in blister copper and in matte produced in Canada, and 22,351,600 lb. estimated as recovered from ores exported. In addition to the recoveries from domestic ores, there were also recovered in British Columbia smelteries 5,033,630 lb. of copper from imported ores. The production in Quebec from pyrite ores was 5,013,560 lb., valued at $1,362,636, as against 5,703,347 lb., valued at $1,551,424, in 1916. These are the quantities reported as being paid for; the actual metal contents were much higher.

The Ontario production is derived chiefly from the nickel-copper ores of the Sudbury district and of the Alexo mine in Temiskaming, supplemented by a small recovery from the Cobalt district silver ores and by shipments made from a few copper properties under development. The total production in 1917 amounted to 42,796,213 lb., valued at $11,632,014, as against 44,997,035 lb., valued at $12,240,094, in 1916.

The British Columbia production was 57,717,535 lb., valued at $15,687,631, as against 63,642,550 lb., valued at $17,312,046, in 1916. The production included 40,720,413 lb. recovered in blister and matte and 16,997,122 lb. estimated recovery from ores shipped to United States smelters.

GOLD

The total production of gold in placer and mill bullion and in smelter production in 1917 is estimated at 747,366 fine oz., valued at $15,449,426, as compared with 930,492 fine oz., valued at $19,234,976, in 1916, a decrease of $3785,550, or 19.69%. This has been the lowest since 1912, when the new Porcupine field caused a considerable increase in Canada's production of gold. The 1916 production was the largest since 1902, when the Yukon output began to decline. The maximum production recorded was $27,908,153, in 1900, and the lowest since that year was $8,382,780, in 1907. Of the total production in 1917, $4,199,563, or 27.5%, was derived from placer and alluvial mining; $9,433,033, or 61.0%, in bullion and refined gold, and $1,816,827, or 11.5%, contained in matte, blister copper, residues and ores exported.

The production in Nova Scotia was only $45,478 in 1917, about equal to that of 1913, which was the lowest ever recorded, and showed a decrease of over 51% from that of 1916. The decrease is mostly attributed to the great increase in cost for labor and material. The production in Quebec is made partly from the pyrites ores of the Eastern Townships and partly from the zinc-lead ores of Notre-Dame des Anges, Portneuf County. Much of this gold is not paid for by the smelters.

The Ontario production of gold was $8,916,113, being about 58% of the total production for Canada, and, though it shows a decrease of 12% from that of 1916, it was the second highest ever recorded. The production from Manitoba, $9137, though small, points to the possibility of this province becoming an important producer. The gold was derived from the gold and copper ores of Herb and Schist lakes, in the new Pas mining division in northern Manitoba.

The production in British Columbia in 1917 was $2,776,558, a decrease of nearly 39%, which was due not only to the high cost of supplies but also in part to labor troubles in that province and the closing down for several months of the Rossland mines, which contribute largely to the output of gold. The production

from the Yukon Territory amounted to $3,671,008, or a decrease of over 16%, and included, in addition to the alluvial gold, a small recovery from the gold and copper ores of the Whitehorse district and the gold-silver-lead ore of the Mayo district. The exports of gold bullion, gold-bearing dust, nuggets, gold in ore, etc., in 1917, are reported by the Customs Department as $15,929,051.

LEAD

The earlier estimates of the production of lead in 1917 included the recoveries of considerable quantities of lead from imported ores. The total production in 1917 of lead in bullion credited to Canadian mines, together with the lead estimated as recoverable from ores exported, was 32,072,269 lb., which, at the average price of lead in Montreal, 11.137c. per lb., would be worth $3,571,889. The corresponding production in 1916 was 41,497,715 lb., valued at $3,532,692, an average price of 8.513c. The decrease in quantity was 9,425,346 lb., or 22.7%, but on account of the higher price there was a slight increase in total value.

The 1917 production included 30,077,230 lb. of lead in bullion, of which a large part was electrolytically refined and 1,995,039 lb. recoverable from ores exported. The lead bullion was produced chiefly at Trail, with small contributions from smelters at Kingston and Galetta, Ont. (The total production of the smelters, including lead from imported ores, was 41,427,304 lb.) The lead ores exported were derived from Notre Dame des Anges, Que., the Surprise mine, Slocan, B. C., and the Silver King mine, at Mayo, Yukon.

The total mine shipments of lead ores and concentrates was about 58.801 tons, containing 37,624,567 lb. of lead, as compared with shipments in 1916 of 84,516 tons, containing 54,124,628 lb. of lead. The exports of lead in 1917 were: Lead contained in ore concentrates, bullion, etc., 13,410,400 lb., valued at $925,056. Exports in 1916 were: Lead in ore, etc., 9,048,400 lb., valued at $558,180, and pig lead 112,100 lb., valued at $7710.

NICKEL.

The production of nickel in 1917 was, as usual, derived from the ores of the Sudbury district, supplemented by the recovery of a small quantity of metallic nickel, nickel oxide, and other nickel salts as byproducts in the treatment of ores from the silver-cobalt-nickel ores of the Cobalt district. The total production was 84,470,970 lb., worth, at 40c. per lb., $33,778,388, compared with 82,958,564 lb., valued at $29,035,497, or 35c. per lb., in 1916. The total production of nickel-copper matte at the smeltery of the Canadian Copper Co. and Mond Nickel Co., in the Sudbury district, was 78,897 tons, containing 83,773,319 lb. of nickel and 42,392,588 lb. of copper, the average percentage of the combined metals in the matte being about 80; the ore smelted (part being previously roasted) was 1,453,661 tons, which, as usual, included a small tonnage from the Alexo mine, in the Temiskaming district. The production in 1916 was 80,011 tons of matte, derived from 1,521,689 tons of nickel-copper ores smelted, the matte containing 82,596,862 lb. of nickel and 44,859,321 lb. of copper.

The refinery under construction at Port Colborne, Ont., by the International Nickel Co. had not been completed at the close of the year. The British American Nickel Corporation continued the development of its nickel properties, particularly at the Murray mine, and work was begun on the first unit of the smeltery a mile distant from the Murray mine. It is expected that construction work on the refinery will begin early in 1918. Nickel was recovered as a byproduct in smelteries at Deloro, Thorold, and Welland, from the silver-cobalt-nickel ores of the Cobalt district. Complete returns have not yet been received, but the total nickel contents of nickel oxide, nickel sulphate, and metallic nickel produced have been estimated at about 697,000 lb. The products recovered in 1916 included 79,360 lb. of metallic nickel, 323,418 lb. of nickel oxide, and 232,450 lb. of nickel sulphate, having a total reported value of $132,896 and containing 361,701 lb. of nickel metal. The exports of nickel in ore matte or other form are reported by the Customs Department as 81,272,400 lb., valued at $8,708,650.

The imports of nickel into the United States during the eleven months ended November, 1917, which included small quantities from other sources as well as from Canada, are recorded as 69,265,880 lb., contained in ore, matte, or other form, valued at $8,869,824, or an average of 12.81c. per lb. The exports of nickel and nickel oxide, etc., during the same period were 21,430,306 lb., valued at $8,702,727, or an average of 40.61c. per lb., of which about 66% were consigned to Great Britain and 30% to Italy and France. The values per pound of these exports to different countries ranged from 38.5 to 48.6c. per lb. The average value per pound of exports in 1916 was 38.775c., the range being from 37.13c. to 45.21c. The average export value in 1914 was 34.26 cents.

SILVER.

The production in silver of 1917 was 22,150,680 oz., valued at $18,034,419, as against 25,459,741 oz., valued at $16,717,121, in 1916, a decrease of 13.0% in quantity, but an increase of 7.9% in value. The high value of the production in 1917 was exceeded only in 1912 and 1913, when the Cobalt camp was at the maximum of its output. The production in Ontario amounted to 19,254,616 oz., valued at $15,676,531, or 87% of the total production for Canada. In 1911, the year of its maximum production, the percentage was 93.8. The production was from the ores of Cobalt and adjoining silver camps, with the exception of 80,863 oz., the output of the gold and copper mines. Of the Cobalt district production, amounting to 19,173,753 oz., 85.3%, or 16,363,605 oz., were recovered in smelteries and reduction works in Canada, and the balance, 14.7%, or 2,810,148 oz., was exported for smelting. Of the bullion produced in Ontario, 9,929,326 oz., or 60.7%, was recovered in the mills of Cobalt, and 6,434,279, or 39.3%, in southern Ontario smelteries.

The production in Quebec was 217,191 oz., valued at $176,830, as against 98,610 oz., valued at $64,748, in 1916, and is derived from the pyritic ores of the Eastern Townships and the zinc-lead ores of Notre-Dame des Anges, Portneuf County. In British Columbia the production was 2,580,521 oz., valued at $2,100,983, as against 3,392,872 oz., valued at $2,227,794, in 1916, showing a decrease in quantity of over 23% and in value of 5.7%. This production includes refined silver, silver contained in smeltery products and estimated recoveries from ores exported. The Yukon production amounted to 90,772 oz., valued at $73,904, as against 360,101 oz.,

valued at $236,446, in 1916, and included silver derived from the placer operations, with also a certain amount recovered from the gold and copper ores of Whitehorse and the silver-lead ores shipped from Mayo. The exports of silver bullion and silver in ore, etc., as reported by the Customs Department, were 21,718,784 oz., valued at $17,621,398, as against exports in 1916 of 25,279,359 oz., valued at $15,637,885.

Zinc

During the last two years there has been a recovery of refined zinc in Canada at the zinc refinery erected by the Con. M. & S. Co., at Trail, B. C. Prior to 1916 all zinc ore mined in Canada was exported for smelting and refining. The establishment of the Trail plant has resulted in the mining and treatment of a much larger tonnage of zinc ores and a part of the present production is still being exported for treatment. The total recovery in Canada of refined zinc, together with the zinc contained in ores exported (less 20% allowed for smeltery losses) amounted in 1917 to 31,227,351 lb., which at the average price of spelter in New York, 8.901c. per lb., would have a total value of $2,779,547. The corresponding production in 1916 was 23,364,760 lb., valued at $2,991,623, or an average of 12.804c. per pound.

Quebec in 1917 is credited with 1,161,062 lb., and British Columbia with 30,066,289 lb. In 1916 the Quebec production was 1,663,200 lb., and British Columbia 21,701,560 lb. The total zinc-ore shipments from mines in 1917 were about 116,660 tons, containing, without any deduction whatever, 61,920,149 lb. of zinc. The total ore shipments in 1916 were 82,077 tons, containing 48,498,078 lb. of zinc.

Iron Ore

The total shipments of iron ores from Canadian mines during 1917 were 215,242 short tons, valued at $758,261, as compared with shipments of 275,176 tons, valued at $715,107, in 1916. The 1917 shipments included 198,092 tons from mines in Ontario and 17,150 tons from mines in Quebec, and of the latter amount a considerable tonnage was from old stockpiles. The ores comprised 197,602 tons of hematite and roasted hematite and siderite, 12,664 tons of magnetite and 978 tons of titaniferous ores.

The principal operating properties were the Helen and Magpie mines of the Algoma Steel Corporation, all of the ores mined being first roasted before shipment. The Moose Mountain Co. continued development and experimental work in concentration and briquetting, but made only small shipments. In Quebec shipments of ilmenite were made from Ivry-on-the-Lake, in Terrebonne County, and of titaniferous ore from St. Urbain, on the north shore of the St. Lawrence. Shipments of magnetite were also made from stockpiles at the Bristol mine, in Pontiac County, and a small tonnage from Ironsides, in Hull Township.

Mine operators reported 169,192 tons of ore exported to the United States and 46,050 tons shipped to Canadians furnaces. The Customs Department shows exports of iron ores 164,004 tons, valued at $660,673, and imports amounting to 2,251,397 tons, valued at $5,124,889. The total quantity of iron ore charged to blast furnaces in 1917 was 2,176,296 tons, of which 92,065 tons were of domestic origin and 2,084,231 tons imported. The imported ore included 874,134 tons of Newfoundland ore and 1,210,097 tons of "Lake ore." Shipments of iron ore from Wabana mines, Newfoundland, in 1917, by the two Canadian companies operating there, were 883,346 short tons, as against 1,012,060 tons in 1916, all of which went to Sydney and North Sydney, in Cape Breton.

The blast furnace plants operated were the same as in the previous year, namely the Dominion Iron and Steel Co., at Sydney, N. S.; the Nova Scotia Steel and Coal Co., at North Sydney; the Standard Iron Company, at Deseronto, Ont.; the Steel Company of Canada, at Hamilton, Ont.; the Canadian Furnace Co., at Port Colborne, Ont., and the Algoma Steel Corporation, at Sault Ste. Marie, Ont.

Pig iron was made in electric furnaces by the Canada Cement Co., Ltd., Montreal; Frazer, Brace & Co., Ltd., Shawinigan Falls, Que.; British Forgings, Ltd., Toronto, Ont.; Electro Foundries, Ltd., Orillia, Ont., and Turnbull Electro Metals, Ltd., St. Catharines, Ont. The total production in electric furnaces of pig iron ferroalloys and steel ingots and castings was in 1917 about 99,000 short tons. The production of ferroalloys in Canada in 1917, chiefly ferrosilicon, but including also spiegeleisen, ferromolybdenum and ferrophosphorus, all with the exception of the spiegeleisen being made in electric furnaces, reached a total of 40,329 tons, valued at $3,471,934, as against a total in 1916 of 28,628 tons, valued at $1,777,615.

Asbestos and Chromite

The production of asbestos continues to increase under the stimulation of war demand. The product has been marketed at much higher prices, and the total sales show a substantial increase. Stocks on hand at the end of 1917 were slightly in excess of those reported at the end of 1916.

OUTPUT AND VALUE OF ASBESTOS 1916 AND 1917

	1916		1917	
	Crude	Milled	Crude	Milled
Output, tons	5,414	112,832	6,268	144,040
Sold, tons	5,893	130,123	5,383	138,802
Value, tons	$1,867,064	$3,266,268	$2,748,071	$4,467,318
Average per ton	$316.82	$25.10	$510.51	$33.67

Exports of asbestos during the calender year 1917 were 93,932 tons, valued at $4,903,326, or an average of $52.20 per ton, and asbestos and waste, 52,088 tons, valued at $430,956, or an average of $8.27 per ton. There was also an export of manufactures of asbestos valued at $55,666. The exports in 1916 were 96,775 tons of asbestos, valued at $3,872,463, or an average of $40.01 per ton, and asbestos sand and waste, 33,564 tons, valued at $241,272, or an average of $7.18 per ton; also manufactures of asbestos valued at $4741.

The shipment of chromite ores and concentrates by mine operators was 36,352 tons, valued at $490,001, containing approximately 8626 tons, or an average of about 23.7% Cr_2O_3. A part of these shipments was made to the customs mill at Lakeside, Black Lake, operated by the Mutual Chemical Co., and the final shipments from the district of ores and concentrates was 23,327 short tons, valued at $572,115, and containing approximately 8465 tons of Cr_2O_3, or an average of 36%. Most of the concentrates shipped averaged 50% Cr_2O_3, while a large percentage of the ore shipments averaged about 32%. The production was, as usual, obtained from the Eastern Townships of Quebec, chiefly at Black Lake and Thet-

ford, with an important contribution from the new area at St. Cyr, in the township of Cleveland, Richmond County. The mine operators' shipments in 1916 were 27,517 tons, valued at $311,460, and containing approximately 6759 tons, or an average of 25.5% Cr_2O_3. Of this amount 13,268 tons was sold to a customs concentrator, and the final shipments of ores and concentrates during the year was 15,249 tons, valued at $310,902. The exports of chromite as reported by the Customs Department were 19,229 tons, valued at $342,528, as against 12,633 tons, valued at $152,534, exported in 1916.

Molybdenum

Molybdenum ore treated in 1917 at the concentrators of the International Molybdenum Co. at Renfrew, Renfrew Molybdenum Mines, at Mount St. Patrick, and the Mines Department at Ottawa, totalled 692 tons. From this ore 80,614 lb. of concentrates were produced, worth $108,501. The molybdenum contents of the concentrates varied from 52.9 to 93.5% of MoS_2. From the plants of the International Molybdenum Co. at Orillia and Tivani Electric Steel Co. at Belleville there was a production of 149,000 lb. of ferromolybdenum, valued at $348,775. Molybdenum is one of the metals to which, because of its use for making high-speed tool steel, the war has lent much importance. During 1917 there was an embargo on shipments of molybdenum from Canada to the United States. At the beginning of 1918, this was lifted, and shipments may now be freely made under license permit. Prices ruling in the United States have been much higher than those paid by the Imperial Munitions Board.

The Province of Quebec possesses the largest individual producing mine of molybdenite in the Moss mine, in Onslow Township, operated by the Dominion Molybdenite Co. This company has a large concentrator, of a capacity of 150 tons of rock a day, using the Callow process for the separation. During 1917, extensive diamond drilling operations were carried on, which blocked out large reserves of ore.

Magnesite

The shipments of magnesite, crude, calcined and dead burned, reached 58,090 tons, representing a value of $728,275. As compared with 1916, this is a proportional increase in value of 38.5%. This increase is to some extent due to the fact that two producing companies are now making dead-burned magnesite. For this purpose, these companies are using the kilns of cement works in Montreal and in Hull, which were not operating on the manufacture of cement during the year.

Pyrites

The customs records show exports of pyrites during 1917 as 279,646 tons, valued at $974,200. Apparently, the exports of copper pyrites from Quebec are not included in this record. Exports of sulphuric acid during 1917 were 18,955,100 lb., valued at $197,888, as against 3,151,700 lb., valued at $74,527, in 1916. Imports of brimstone, or crude sulphur, in 1917 were 82,445 tons, valued at $1,515,309, and 73,467 tons in 1916, valued at $1,186,618. Imports of sulphuric acid in 1917 were 216 tons, valued at $15,680, as against imports in 1916 of 2503 tons, valued at $115,173.

Remember the Comfort Fund of the 27th Engineers.

Deepest Well in the World

The deepest well in the world, already 7363 ft. deep, according to the U. S. Geological Survey, is now being drilled on the Goff farm, 8 miles northeast of Clarksburg, in northern West Virginia. Until Jan. 24 the record for depth had been held by a boring at Czuchow, in Silesia, which had reached a depth of 7349 ft., but on that day Dr. I. C. White, the state geologist of West Virginia, announced that the Hope Natural Gas Co. had driven the bit to a depth of 7350 ft., one good American foot in excess of the German record. Moreover, the drilling is still in progress, and as sufficient length of cable and adequate power and tools are at hand, the prospects are good for driving still farther down into the crust of the earth.

C. E. Van Ostrand, of the Survey, found that at a depth of 7000 feet in the well the temperature is 152° F., and that the rate of increase at this depth is about 1° in 51 ft. of depth. This shows that the outer crust of the earth in this region is relatively cool, for in many other regions the temperature increases much more rapidly with increase in depth. Even at some places in the United States, according to unconfirmed observations, the temperature increases at the rate of 1° in a vertical distance as little as 25 ft., and that within a few hundred feet of the surface. Nevertheless, Mr. Van Ostrand estimates that the temperature of the rocks beneath the Goff well will be found at the boiling point (212° F.) at a depth somewhere around 10,000 feet.

The Goff well is near the center of the great Appalachian coal field basin or trough, and is being drilled in search of deeper oil sands than have yet been reached in this part of the basin. The sand upon which most hope is based is the "Clinton" sand, a formation of Silurian age, which is prolific of gas and oil across central Ohio from Cleveland nearly to the Ohio River. From its outcrop this formation dips gently to the southeast beneath successively younger formations nearly if not all the way to Clarksburg.

New Caledonian Mineral Exports

According to the report of the Chamber of Commerce of Nouméa, New Caledonia, exports of nickel ore in 1916 amounted to 30,579 metric tons; of chrome ore, 74,116 metric tons, and of nickel matte, 4935 metric tons. Of the nickel ore, 29,129 metric tons were shipped to England, 7807 to France, and the remainder to Japan. The United States received 33,491 tons of the chrome ore, England 31,308, France 9301 and Japan the remainder. The nickel matte was shipped as follows: United States, 3352 metric tons; England, 800, and France, 783 metric tons. No exports of cobalt are reported.

Silver Mines at Kongsberg, Norway, produced 8072 kilos of silver during the last fiscal year, according to a statement dated Feb. 5, 1918, in *Commerce Reports*. One kilo equals 32.15 troy oz. This amount is considerably below the estimated output, which had been placed at 12,000 kilos. Forty per cent. of the total output was obtained from the Kongens and Samuels mines and 20% from the Gottes Hilfe mine. It is estimated that 10,000 kilos of silver will be produced during the coming fiscal year.

The Quarterly Report of Nevada Consolidated

Production for the quarter ended Dec. 31, 1917, was 22,153,158 lb., as compared with 20,217,673 lb. the previous quarter. Total production for the year was 82,040,508 lb. During the quarter 1,087,158 dry tons of Nevada Consolidated ore, averaging 1.45% copper, were milled, as compared with 1,014,031 dry tons, averaging 1.46% copper, for the previous quarter. Of the tonnage milled, 78% was supplied from the pits and 22% from the underground workings of the Ruth mine. In addition to the above, 75,987 dry tons of the Consolidated Coppermines Co. ore were milled during the quarter. The cost of copper produced, including Steptoe plant depreciation and all charges except ore extinguishment and excess-profits tax, and after crediting all miscellaneous earnings, was 12.73c. per lb., as compared with 11.78c. per lb. for the previous quarter. Excluding the item of depreciation, the cost was 11.91c., as compared with 10.93c. for the previous quarter.

There was a deficit for the quarter of $177,291, after distribution on Dec. 31 of $1 per share, amounting to $1,999,457. There was set aside $183,844 for plant and equipment depreciation and $65,217 for ore extinguishment, leaving a net debit to earned surplus for the quarter of $426,353, but a credit to earned surplus for the 12 months of $1,363,450, after payment of all dividends, and a balance of $13,717,093 in earned surplus at Dec. 31.

The operating expenses for the quarter include $169,874, representing accrued county, state, state bullion and Federal income taxes, or a total of $729,664 for the year. No reserve has been set up to cover the accrued excess-profits tax, and the company is not yet in a position to definitely determine what this amounts to. The earnings for the quarter are based on the prices actually received for copper delivered and the sales contracts actually closed for future delivery, plus all unsold copper carried at 13½c. per pound, which, taken together, makes an average carrying price for the quarter's production of 20.14c. per pound. This price has resulted from the large quantity of copper which at Dec. 31, 1917, was carried in the accounts as unsold at the inventory figure of 13½c. While all copper available for delivery from the refinery has been sold and delivered, it must be understood that as the company owns its smelter, and therefore delivers its blister copper to the refinery at the Atlantic seaboard, any time consumed in transit is entirely for the mining company's accounts. Consequently, the unprecedented transportation delays which have prevailed have resulted in the company having a much larger quantity of copper in transit than under normal conditions, and thus deliveries of copper from the refinery for the mining company's account were materially less than the mine production.

Quarterly Report of Utah Copper

Utah's production for the quarter ending the fiscal year 1917 was 50,802,793 lb., as compared with 54,762,544 lb. for the previous quarter. The gross production for the year 1917 was 206,174,442 lb., as compared with 196,752,631 lb. for 1916.

The total quantity of ore milled during the quarter was 3,426,300 tons, or a decrease of 13,100 tons as compared with the third quarter of the year. The average grade of the ore was 1.25% copper, as compared with 1.31% copper for the third quarter of the year, and the average extraction was 59.15%. The percentage of recovery was low, partly because of the unsettled operating conditions in the mills, due to various improvements under way, but principally because of the unusually large tonnage treated and the comparatively low copper content in the headings.

The average cost per pound of net copper produced from concentrates during the quarter, after making allowance for smelter deductions and crediting miscellaneous income from Utah operations only, was 12.796c., as compared with 10.860c. for the third quarter, 9.464c. for the second quarter and 10.843c. for the first quarter of 1917. This comparatively high cost for the fourth quarter was due partly to the necessarily large charge made against operations for increased state and Federal taxes, partly to the low grade of the ore, and partly to the fact that no dividends were declared by the Bingham & Garfield Railway Co.; it having been deemed advisable to accumulate a sufficient reserve during the last quarter of the year to cover all possible tax requirements of the railway company. The total net profit for the quarter was $9,340,784; disbursements to stockholders, $5,685,715, and net surplus, $3,655,069. The earnings for the fourth quarter were computed on a basis of 29.965c. per pound for copper, as against a basis of 14.03c. for the third quarter, 27.977c. for the second and 26.173c. for the first quarter. The wide difference between the carrying price for this quarter and the last is due almost entirely to the variation in the quantity of unsold copper on hand at the beginning as compared to that at the end of the quarter, as, according to the established custom, all unsold copper is carried on inventory at 13.5c. per pound. During the last quarter of the year copper sales were much larger than copper production. This resulted in a substantial decrease in amount of unsold copper on hand Dec. 31.

During the period there was removed a total of 938,333 cu.yd. of capping, as compared with 1,283,107 cu.yd. for the previous quarter. This decrease of 344,774 cu.yd. was due principally to the fact that the steam shovels working in capping on some of the upper levels were shut down part of the time on account of a shortage of coal. The total amount of capping removed during the year was 4,271,868 cu.yd., being an average of 1,076,967 cu.yd. per quarter.

Report of Hollinger Con. G. M., Ltd.

The Hollinger Consolidated Gold Mining Co., Ltd., reports that for the year ended Dec. 31, 1917, 508,139 tons of ore and 6162 tons of concentrates yielded gross, $4,216,938, a profit of $1,820,414, and dividends amounting to $738,000; expenditures for plant reached $673,237. The operating costs, which are given in considerable detail in the report are: Mining, $2.959; milling, $1.017, and general charges, $0.463; total, $4.439 per ton.

The mine development totaled: 644 ft. shafts, 12,974 ft. drifts, 12,721 ft. crosscuts, 3357 ft. raises, 8024 ft. diamond drilling; total, 29,696 ft. The monthly tonnage milled ranged from 31,377 to 48,119; 750 miners were employed; 57.6 to 83.2% of the ore was drawn from stopes and 42.4 to 15.8% from development.

In the mill, 508,139 tons, average assay value $8.67 per ton, and 6162 tons old concentrates, assay value $7.71 per ton, were treated. Gross values were $4,421,131; loss in tailings, $159,193, and net values recovered, $4,261,938. Milling details are summarized in the following:

Average tons per day	1409
Per cent. of possible time run	70.2
Tons per 24 hours running time	2007
Stamp duty per 24 hours running time, tons	15.4
Solution precipitated per ton of ore, tons	2.15
Value per ton in tailings	$0.31
Cyanide consumed per ton of ore, lb	0.448
Zinc consumed per ton of ore, lb	0.360
Zinc per ton of solution, lb	0.175
Lime consumed per ton of ore, lb	2.257
Lead acetate per ton of ore, lb	0.331
Average value pregnant solution, per ton	$4.038

The average number of men employed during the year was 1045, distributed as follows:

Miners		General	
Exploration	29	Mill and refinery	108
Development	270	Engineering staff	17
Production	394	Clerical staff	11
	693	Miscellaneous	41
			177
Mechanics		**Total**	
Operation	56	Miners	693
Maintenance	64	Mechanics	181
Construction	61	General	171
	181		1045

At both mine and mill, labor shortage reduced output. Ore reserves are given in greater detail than is customary to find in the reports of mining companies. The estimated tonnage in 39 veins is 4,494,510, average value $8.95 and gross value (estimated) $40,231,435. During the year a deficit of $269,590 was wiped out and a surplus of $712,724 accumulated. In spite of labor difficulties and the increased cost of supplies, the year was successful.

Annual Report of the Yellow Pine Mining Company

The mines of the Yellow Pine Mining Co., situated close to Goodsprings, Clark County, Nevada, produced in 1917, 20,047 tons of crude ore, of which 464 tons were shipped and 19,582 tons were milled.

The shipments during the year were:

Class of Ore	Tons	Per Cent. Lead	Per Cent. Zinc	Ounces Silver	Net Value per Ton
Lead concentrate	3,157	52.6	13.6	29.8	$ 80.11
Zinc concentrate	12,904	5.15	32.0	3.18	23.72
Zinc slimes	3,512	6.9	32.2	3.53	23.30
Crude zinc ore	411	3.5	37.9	1.54	32.71
Crude lead ore	2.68	63.1	5.65	21.6	109.16
Crude mixed ore	50.97	16.0	27.2	11.5	24.76
Total	20,040				

Total value, including miscellaneous receipts, $662,256.08

The total cost of operation was $247,477, or $12.35 per ton shipped. Gross receipts were $33.05 per ton shipped and the profit $20.70 per ton. Gross profit, $414,778. The cost of mining per ton mined was $4.52; costs of timbering were $10.60 per ton. Development work, totalling 3131 ft., averaged $12.08 per ft.

Additions to mine equipment during the year include the installation of a 325 cu.ft. air compressor, with power plant, and new piping throughout the mine. Four new drills and a small air hoist were also purchased. New ore bins of 200 tons capacity were constructed, and a complete water system, with pumping plant and ample storage tanks, was installed. The company also constructed two new bunk-houses, to accommodate 36, and a four-room foreman's cottage.

During 1917, the mill operated 5502.5 hours, or a total of 344 sixteen-hour days, treating a total of 19,976 tons, or an average of 3.63 tons per hour. The average cost per ton was $1.95. From a mill-head averaging 14.85% lead, 29.1% zinc and 7.55 oz. silver per ton, there were produced 3157.9 tons of lead concentrate, averaging 52.6% lead, 13.6% zinc, and 29.8 oz. silver per ton; 12,904.9 tons of zinc concentrate averaging 5.15% lead, 32.0% zinc, and 3.18 oz. silver per ton, and 3512.7 tons of slime averaging 6.9% lead, 32.2% zinc and 3.53 oz. silver per ton. Waste sorted from the belt amounted to 393.6 tons. In the past year the railroad handled a gross tonnage of 42,623.4 at an average cost of $0.493 per ton. Based on actual tonnage shipped from Jean to the smelters, the average cost was $1.048 per ton.

It is of interest to note that, owing to a difference in ore market conditions, milling is to be discontinued and all ore will be shipped in the crude state. A large proportion of the product will be shipped to oxide plants as a mixed lead-zinc ore. Sorting facilities will be improved at the mine for this purpose. The milling plant will be kept intact for future needs. Estimates of available tonnage have not been made, but it is stated that sufficient tonnage for the ensuing year is assured.

Alaska Gold Co.'s Quarterly Report

The quarterly production report issued by the Alaska Gold Co., covering the operations for the fourth quarter of 1917 has recently been distributed. A summary for the quarter and for the year is given in the following table:

	Fourth Quarter	Total for Year 1917
Tons milled	532,699	2,240,346
Gross value per ton	1.066	$1.100
Yield	0.8608	0.8939
Tailings	0.2050	0.2061
Extraction	80.70%	81.27%
Value recovered	$0.8608	0.8939
Operating expenses less miscellaneous income	0.7901	0.7717
Total profit per ton	$0.0707	$0.1222

During the quarter the mine produced 5700 tons per day; 410,629 tons were broken in the mine; 533,054 tons of ore were trammed to the oreways, leaving a total of 991,420 tons of broken ore in the stopes. A resurvey on Dec. 31 showed a total of 2,357,588 tons of ore in the stopes. The low grade and small tonnage of ore delivered to the mill during the fourth quarter were due to the continued scarcity of miners, which prevented new developments of any consequence and limited tonnage for the mine to a point much below transportation and milling capacity.

Photo by courtesy of Drucker & Co., New York.

MEDAL PRESENTATION OF THE MINING AND METALLURGICAL SOCIETY OF AMERICA

At the guest table in the upper right hand side of the hall the members from left to right are M. L. Requa, D. W. Brunton, H. H. Webb, Pope Yeatman, Walter R. Ingalls, Sidney J. Jennings, Major Mudd, Hennen Jennings, Eugene Meyer and Thomas H. Leggett. Captain Berry joined the party at this table later.

Medal Presentation of the Mining and Metallurgical Society of America

THE Medal Presentation dinner of the Mining and Metallurgical Society of America took place on Thursday evening, Mar. 21, 1918, at the Columbia University Club, New York. More than 125 members and guests assembled in tribute to Pope Yeatman, to whom the society's gold medal for 1918 was presented. Walter Renton Ingalls, president of the society, presided, and in making the presentation address commented upon the significance of the gift of the annual medal by the society.

The more important facts concerning Mr. Yeatman's life are presented in the following brief résumé: Pope Yeatman was born in St. Louis on Aug. 3, 1861. He received the degree of Engineer of Mines from Washington University, St. Louis, Mo., in 1883. From 1883 to 1895 he was engaged in mining in Mexico, Missouri, New Mexico and Colorado. From 1895 to 1904 Mr. Yeatman was in South Africa. He was in charge

POPE YEATMAN

of the opening and development of the Robinson Deep Mine of the Consolidated Gold Fields of South Africa from 1895 to 1899. Later he was general manager of the Simmer and Jack Proprietary Gold Mining Co., and general manager and consulting engineer to the Randfontein Estates Gold Mining Co., and responsible for the organization, equipment and development of this whole group of mines. Between 1906 and 1916 he was consulting engineer to M. Guggenheim Sons and the Guggenheim Exploration Co.; developed and equipped the Nevada Consolidated Copper mine, and developed and managed the Steptoe Valley Smelting and Mining Co., the Chile Exploration Co. and the Braden Copper Co., of Chile. Of the Braden and Chuquicamata mines, in Chile, Mr. Yeatman has been in charge from their earliest stages.

Mr. Ingalls, preceding his address, laid special emphasis upon the fact that the medal was presented to Pope Yeatman for eminence as an administrator of mines. Continuing, Mr. Ingalls said:

Committees in writing formal documents of record have necessarily to confine themselves to bald statements of fact. They can not, or do not, put any coloring upon their sketch. Their work is like that of the painter who draws his outlines with pencil. It falls to me to paint the picture, but, appreciating my own imperfections as a painter, I have arranged with my colleagues to give the finishing touches.

Some of us who are here tonight have known Mr. Yeatman for more than 30 years. One was a college friend of his. Others became acquainted with him when he used to visit Colorado in the '80s. Our glimpses of him then were few. Like most of us who were getting our youthful training, he was flitting from place to place, and except when we were caught in some eddy that detained some of us together, our courses did not often intersect. Then came the time, in the '90s, when he disappeared from our sight. This was when he joined the great hegira of American engineers to South Africa. He remained out there for 10 years. I am obliged to skip that part of his career—I did not go to South Africa. But some of our colleagues who did go there, and were associated with him, will tell of his important work and his development while there. He returned to the United States full grown. It was well for him and well for our industry that he did come back just then. Our industry was in a transition stage, when big men, and especially administrative men, were needed.

It was about 12 years ago that the copper mining industry was entering upon a fundamental change. It is true that for a long time previously our operations had been becoming bigger and bigger, our knowledge of engineering had been improving, and mining had been in the process of conversion into a recognized business, instead of being the gamble of the lucky strike. If it had not been for such real progress in the art, if it had not been for the experience in real mining engineering, gained in South Africa and elsewhere, Jackling and Requa and others might have had the conception of digging low-grade ore at the rate of 10,000 tons a day, of putting in $10,000,000 worth of plant to start with, but investors bold enough to furnish the money would have been hard to find.

Mr. Yeatman was naturally called to administer one of the first of these great companies—the Navada Consolidated. From the viewpoint of fully integrated concerns—concerns equipped to do everything from the mining of the ore to the smelting of the concentrate—it was the first. Mr. Yeatman did not enter into this great enterprise at its very beginning. The Nevada Northern Railway had already been built, and plans to a more or less extent for the mining, milling and metallurgical plant had been made, but when I had the pleasure of going over the ground with Mr. Yeatman in the summer of 1907 things were not very far ahead. While he was not the creator of this as an engineering and commercial project, he was the organizer who made it a going concern. What opportunity did an engineer administrator ever have that was more brilliant and what other case is there of such a splendid fulfilment of promises? This was a task of the first order of magnitude—the administration of a railway 150 miles long, of a mine with new problems that was called upon to produce 10,000 tons of ore per day, of a mill that had to treat that immense tonnage of ore and a smeltery to convert the concentrates into copper, the whole development representing an outlay of some $10,000,000 on the part of courageous investors who had to risk all that money before they could expect any returns. If the Nevada Consolidated had been a failure, the development of all the subsequent porphyry mines would have been under a cloud, and the country might have been deprived of their copper at a time when the metal was greatly needed. But the Nevada Consolidated was not

a failure. It was a spectacular success, and in being such it justified not only the hopes of its stockholders, but also it inspired confidence in other enterprises of a similar kind. The debt that is owed to Mr. Yeatman's splendid administration is therefore deeper and bigger than what concerns those who were interested in this particular enterprise alone.

After Nevada Consolidated was put in the way of running smoothly, Mr. Yeatman's annual reports as consulting engineer were models of what such reports ought to be. In the course of time Mr. Yeatman exhibited the supreme quality of an administrator; that is to say, the creation of such an organization that his own services were not constantly required and he could set himself free to undertake new things. The new things were waiting for him in the shape of the Braden and Chuquicamata mines, in Chile, two of the great copper mines in the world, one of them probably the greatest. Mr. Yeatman's task at Chuquicamata, in its magnitude and its character, was even more stupendous than was his great task in Nevada. We may look upon Chuquicamata as the great triumph of modern mining and metallurgical engineering. For the treatment of a new kind of ore in a remote and inaccessible part of the world it was necessary to devise an entirely new metallurgical process, a process that was no less revolutionary than the production of electrolytic copper direct from the ore, which previously was not a successful metallurgical process anywhere, although numerous metallurgists had tried to make it so. In all of this work Mr. Yeatman would be the very last one to minimize the extraordinary value of the services of his colleagues, least of all those of Mr. Cappelen-Smith, to whom the new metallurgy was due; but Mr. Yeatman himself was the coördinator of everything, the administrator, and because he was such he surrounded himself with such able collaborators.

The test of any theory is the ability to prophesy and ascertain that results are in conformity with the prophecy. This is why we regard Chuquicamata as the great modern triumph of mining and metallurgical engineering. With the guidance of merely experimental work, its engineers and administrators were able to say that certain things were going to happen, and were able to say it with the confidence that inspired the investment of many millions of dollars; and the things did happen as they said they would.

Mr. Yeatman's way of accomplishing these things calls to my mind the words of John Ruskin, which express the spirit that must have governed him throughout his career: "We are not sent into this world to do anything into which we cannot put our hearts. We have certain work to do for our bread, and that is to be done strenuously; other work to do for our delight, and that is to be done heartily; neither is to be done by halves or shifts, but with a will; and what is not worth this effort is not to be done at all."

In a few timely and felicitous words Mr. Ingalls then presented the society's gift to Mr. Yeatman. Mr. Yeatman briefly and wittily replied. Major Mudd, a life long friend and associate, told about Pope Yeatman's early life. H. H. Webb, Thomas H. Leggett and Sidney J. Jennings related South Africa incidents. Eugene Meyer then briefly described the more recent work of Pope Yeatman and his connection with the war work at Washington.

Telegrams were received and read from Herbert C. Hoover, Robert H. Richards, James F. Kemp and John Hays Hammond. Mr. Hammond's telegram follows:

As a mining engineer, the achievements of Pope Yeatman are known the world over. The high honor so deservedly conferred upon him by the Mining and Metallurgical Society this evening attests the esteem in which he is held by his professional confrères. Such approbation is praise indeed. Pope Yeatman is an honor to his profession. My own appreciation of his professional ability is known by the fact that for many years in Africa and subsequently in this country he was one of my most trusted assistants. It is especially with reference to Pope Yeatman as a man that I wish to record my esteem. I had known him in my student days at Yale. Then as an older boy I had the opportunity to size him up. It was because of my implicit confidence in his integrity, his sense of duty and his level-headedness when he was a youth that I gave him his first position in Africa. It was his opportunity, and he made good. He has continued unfailingly to make good ever since in the many responsible positions for which he has been selected by keen judges of men. I am a great believer in the mother's boy. Pope Yeatman was a reverent and devoted son and a kind and loyal friend to those who enjoyed the privileges of his friendship. These are the chief qualifications for real and abiding success in character, and Pope Yeatman possesses them in the highest degree. In the new career to which he is patriotically dedicating his splendid abilities, Pope Yeatman will again make good, and while reflecting credit on his profession he will prove an honor to his country.

Russian Mineral Production

No bismuth was produced in Russia in 1916, the Russian Bureau of Mines reported, according to R. C. Tredwell, consul at Petrograd. The output of antimony was so small that no statistics have been gathered. Of molybdenum (MoS_2), only 150 poods (5417 lb.) was produced, all of which was used for domestic purposes. The value could not be ascertained. About 2000 poods (72,220 lb.) of tungsten, concentrated (60-65% WO_3), was produced, the value of which is not given. The total amount was used in Russia. Since 1914 all bismuth, molybdenum, and tungsten have been used for war purposes. In 1917, it is estimated that 6000 poods (216,680 lb.) of tungsten ore (65% WO_3), 50 poods (1806 lb.) of bismuth ore (60% Bi), and 200 poods (7220 lb.) of molybdenum (45% Mo) were produced.

Potash from Cement Dust

Potash is being extracted from cement dust at present at two plants in the United States, one at Riverside, Calif., and the other in Maryland. The former has been in operation for two years. The two are said to produce an approximate total of 3000 tons of pure potash a year. It is estimated by the Department of Agriculture that 113 cement kilns in the United States are wasting 87,000 tons of potash annually through volatilization. The potash now being extracted at the Maryland plant costs one-third the pre-war selling price of 70c. a unit, it is asserted. Officials at the latter plant are said to have stated that collection of the potash does not involve any change in methods of manufacturing cement. A plant now under construction in the Middle West, it is estimated, will be able to handle the dust from 2000 bbl. of cement daily.

Remember the Comfort Fund of the 27th Engineers.

Thomas F. Noon

Thomas F. Noon, president of the Illinois Zinc Co., died at Phoenix, Ariz., on Mar. 2. He had been in poor health for some time. The immediate cause of his death was pneumonia.

Mr. Noon was born in Peru, Ill., in 1857, and was educated in the public schools of that city. One of his first employments was in the local postoffice. In 1880 Mr. Noon entered the employment of the Illinois Zinc Co. as a clerk and bookkeeper, and during the remainder of his life was associated with that company. Although not trained as a technical man, he acquired an extensive knowledge of metallurgy and engineering through his association with the works, which in the early days ranked among the most complete and comprehensive of the zinc smelting works of the United States, its manufacturing branches comprising the production of spelter,

THOMAS F. NOON

sheet zinc and sulphuric acid. Mr. Noon took pains to add technical knowledge to the sound business training and keen mercantile sense which characterized him throughout his business career.

In 1898 Mr. Noon was elected general manager of the Illinois Zinc Co.; a few years later he became vice president as well as general manager, and in 1911 he was elected president, still continuing to perform the duties of general manager. He was an indefatigable worker, unwilling ever to relax, and this no doubt was the cause of the ill health that finally overtook him and led to his untimely death.

Personally Mr. Noon was a most attractive gentleman, and he was universally beloved, not only by his associates and competitors in business, but also by the men of the works whereof he was head. The friendship that existed between himself and the men in his employ was a very real thing. This was always a matter of pride to Mr. Noon and a matter of consequence to his men, who looked upon him as a true counsellor. He was of the best type of industrial leaders.

Mr. Noon participated freely in civic affairs. He was the head of one of the local banks and was a member of many of the local organizations. He is survived by his wife and four children.

Electric Hoist Makers To Co-operate

The Electric Hoist Manufacturers' Association has offered the services of the member companies to the Government in meeting the extraordinary demand for their product. The War Industries Board has requested full information concerning the ability of the manufacturers to handle the business offered them, as well as what effect priority orders and embargoes on shipments have had upon the trade.

Electric hoists for shop use and for handling material have gone through various stages of development during the last 15 years, and like all classes of shop machines, the association maintains, they cannot be successfully designed on the basis of theory alone. Now that it is thought that the experimental stage has been passed and acceptable designs have been developed, it seems wise to the manufacturers to coördinate the total experience and to make available for the user all that is best in electric hoist design and practice. With this object in view, the manufacturers of the United States organized the association, comprising the following companies: the Brown Hoisting Machinery Co., Detroit Hoist and Machine Co., Euclid Crane and Hoist Co., the Franklin-Moore Co., Link Belt Co., Roeper Crane and Hoist Works, Shepard Electric Crane and Hoist Co., Sprague Electric Works, and the Yale and Towne Mfg. Co. The officers of the association are as follows: F. A. Hatch, chairman, Shepard Electric Crane and Hoist Co.; F. W. Hall, vice-chairman, Sprague Electric Works; C. W. Beaver, secretary-treasurer, the Yale & Towne Manufacturing Co.

The association holds monthly meetings. It will consider uniform nomenclature pertaining to types and parts of electric hoists, fix upon a standard by which hoist motors shall be rated and promote standardization of the hoists as far as possible. It will also collect and disseminate information and statistics relative to the industry and provide facilities and opportunities for study and education in regard to its economics. Membership in the association is confined to those engaged in the manufacture of monorail electric hoists.

Accidents in Canadian Mines

During the calendar year 1917, the number of men employed in Canadian mines, quarries and concentrating mills was 6311, as compared to 6601 for the preceding year. These figures are on the basis of 300 days' work. The work in the mines has been unusually active, notwithstanding the rainy weather. Although a large number of men new to conditions of the mines have found employment, the total number of accidents has been much less than last year. The number of fatalities is notably less than that of the twelve preceding months, being 4 against 18. The number of accidents reported to the Canadian Bureau of Mines during 1917 was 172. The proportion of fatalities per 1000 men per year of 300 days' work was 0.6.

How One Mining Company Pushed the Second Liberty Loan

United States Government Second Liberty Loan of 1917

EMPLOYES OF THE ST. JOSEPH LEAD COMPANY:

The United States Government asks us to lend all we can spare of our savings to help win the war, thus insuring our happiness and freeing our children from the danger of militarism and autocracy.

It is our patriotic duty to lend our savings to our Government. We love our country and our own happiness is wrapped up in its success. Let us all take off our coats and meet the emergency—do all in our power to help.

Our young men who have joined the colors are giving their full time and risking their lives and health. We who stay behind can hardly do less than help to the utmost of our ability with our money. How much more they are giving than is asked of us! Buying these bonds is patriotism made easy. Four per cent interest is more than most savings banks pay. If you want your money a savings bank may require you to give sixty days' notice. A bond of the United States Government is as good as money and can always be turned into money quickly.

This is a wonderful opportunity and the St. Joseph Lead Company recommends its employes to purchase these bonds and will lend its assistance so as to make it possible for them to acquire bonds of this new Liberty Loan on the same easy terms as were offered when the first Liberty Bonds were sold. The plan is as follows:

PLAN

Each subscriber for a $100 Bond will be required to leave with the company $2 from his weekly pay, commencing with the week ending November 17, 1917, and $2 each week thereafter for a period of fifty weeks. This will complete the full $100 payment and on November 17, 1918, the $100 Bond will be delivered to him, together with $4 in cash, the amount of the full year's interest. If he subscribes for a $50 Bond only $1 a week will be deducted and so on in proportion whether his subscription be less or greater than $100.

An employe subscribing to the Liberty Loan under the terms of this plan need have no fear of forfeiture in case he should be unable to complete his payments owing to sickness or misfortune of any kind or by leaving the employ of the company, for in any such event the company, upon written request, will release him from his obligation and return to him the amount of money he has paid in with interest at the rate of 4% per annum. If, however, a subscriber leaving the employ of the company desires to continue his weekly payments he may do so, and he will be treated exactly the same as if he had remained in the company's service.

SUBSCRIPTIONS.

Subscriptions to the New Liberty Loan on the weekly payment plan can be delivered to any office of the company. They will then be forwarded to the head office at Bonne Terre, and each subscription will be acknowledged by a personal letter signed by an officer of the company.

The company will subscribe in its own name and pay for sufficient of the bonds of the proper denominations to provide for all the subscriptions of its employes but in order to do this all subscriptions must be received before October 25, 1917.

A short and plain description of these 4% Liberty Bonds will be found below.

ST. JOSEPH LEAD COMPANY,
Clinton H. Crane,
President.

SECOND LIBERTY LOAN OF 1917

4% BONDS

AMOUNT to be $3,000,000,000 par value plus (optional with the Government) 50% of oversubscription.

DATED November 15, 1917. DUE November 15, 1942. Redeemable after November 15, 1927, at par and interest.

INTEREST at the rate of 4% per annum, payable May and November 15th of each year.

DENOMINATIONS will be $50 and multiples thereof.

TAX EXEMPT as to all taxes except estate and inheritance taxes, income surtaxes and excess profits or war profits taxes imposed by the United States. The income from the principal amount of $5,000 or less of these bonds is exempt from all taxes except estate or inheritance taxes.

CONVERTIBLE into bonds of any new issue that bears a higher rate than 4%.

TERMS OF PAYMENT will be 2% with application, which must be made before October 28, 1917; 18% on November 15, 1917; 40% on December 14, 1917; 40% on January 15, 1918. Payments can be made in full up to $1,000 par amount of bonds.

ALLOTMENT AND DELIVERY of the bonds in amounts of $1,000 or less may be made on and after October 10, 1917, in full. Allotment above $1,000 to be made after close of subscriptions.

Form of Subscription on Weekly Payment Plan

United States Government Second Liberty Loan

4% Convertible Gold Bonds

ST. JOSEPH LEAD COMPANY,
Bonne Terre, Mo.

You have advised me that you are purchasing certain United States of America 4% Liberty Loan Bonds. I desire to become the owner of bonds to the amount of .....Dollars, and hereby authorize you to deduct the sum of .....Dollars from my wages each week upon the mutual agreement that when these deductions equal the amount of .....Dollars (plus accrued interest at 4% on said total amount and less 4% interest on the periodic payments), you will deliver to me 4% Liberty Loan Bonds to the amount of .....Dollars par value, but in the event that I make payment in full for the bonds on or before November 15, 1918, then I am to receive the full annual interest of 4% on the amount of the bonds subscribed and paid for, and to have no interest charged against me.

Dated .....1917.

.....
(Name of Employee)

Accepted and confirmed by
ST. JOSEPH LEAD COMPANY,

by .....

The foregoing photographic reproduction of a circular issued by the St. Joseph Lead Co,. Bonne Terre, Mo., illustrates the method by which that company has developed a plan for the sale of United States Liberty Loan bonds to its employes, which might well be adopted by other mining companies. The plan is exceedingly simple and practicable. The employe signs an agreement to purchase a stated amount in Liberty Bonds and authorizes the company to deduct each week from his wages a stated sum. This sum amounts to $2 per week for each $100 bond. If the bond is completely paid for within the year, the employe receives the bond, together with $4, the first year's interest.

Economic Program in Great Britain

"Increasing government control in almost every direction," writes the London *Economist*, in its commercial review of 1917, "characterizes the industrial history of 1917. The scarcity of man-power and need for the maximum output in all trades connected with the war, have made central organization necessary, while the lack of some raw materials necessitated rationing schemes. The diversion of labor and capital from production has at last made itself felt, and there are signs that the luxurious spending engendered by the artificial prosperity of some industries will perforce be checked.

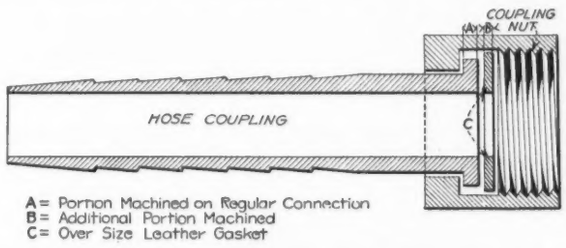
"Essential trades, however, can absorb any surplus labor, and official regulations have probably done much to diminish the waste of effort inherent in any competitive system, in spite of the irritation among business men caused by official interference and the mistakes due to official ignorance. Manufacturers are now considering the uses to which their war-time plant can be turned when peace returns."

Details of Practical Mining

Nut and Gasket for Air-Hose Couplings

By W. V. De Camp*

Every mine superintendent and foreman is probably familiar with the difficulty of maintaining tight air connections in machine air hose, and also with the too common practice among miners of using a piece of fuse for a gasket. The making of gaskets in this manner every time a hose is connected results in loss of time; but probably the greatest loss is due to the expansion of the fuse gasket under pressure, with the resulting cut-off of the air supply. It is not uncommon, when gaskets made of fuse are used, to find the air passage



SECTION SHOWING MACHINED COUPLING NUT, GASKET AND HOSE COUPLING

reduced to an opening about the diameter of a lead pencil as a result of placing not only one gasket in the connection but often two or even three.

Where the standard water-hammer drill hose connection is in use, it is possible to practically eliminate this difficulty by employing a leather gasket cut to fit. However, a miner will use several new gaskets every shift, and it becomes difficult to maintain a sufficient supply. Even if the gasket is cut oversize, so that it has to be jammed down into the thread, it is likely that the miner will trim it down to size so that it fits loosely, and when the hose is disconnected it drops out.

All of this trouble can be obviated and a satisfactory connection assured by adopting a properly designed fitting. As shown in the illustration the part of the hose-coupling nut marked *A* is the portion ordinarily machined out to take the shoulder of the hose coupling Machining out an additional part *B* exactly $\frac{1}{8}$-in. wide to the same depth as the portion marked *A* provides room for a gasket $\frac{1}{8}$ in. thick. The machined out part marked *B* reduces the number of threads on the coupling. nut, but still leaves an ample number. In order to make a leather gasket stay in the nut when disconnected, it is necessary to cut the outside diameter of the gasket equal to the diameter of the machined part *B;* and it becomes necessary to force the gasket marked *C* into place, which is often difficult; but once in place it can be removed only by cutting. In this way, by putting a gasket in each hose connection, when the hose comes to the surface for repairs it is possible to keep gaskets in place for an indefinite period.

*Mining engineer, Mayer, Ariz.

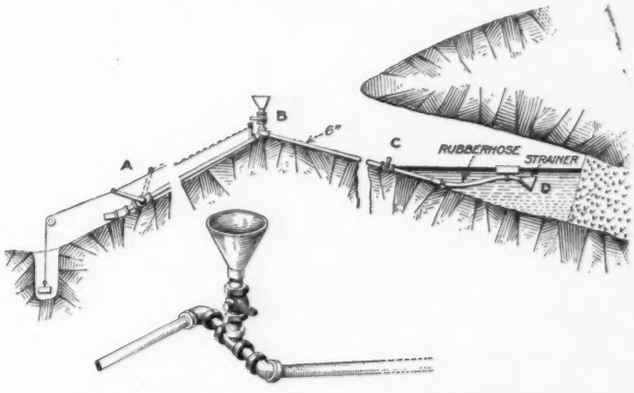
Siphon To Unwater a Mine

By J. A. MacDonald*

Under certain conditions, as in the case of a deposit dipping at such a flat angle that the workings do not extend more than 20 or 30 ft. vertically below the mine entrance, a simple siphon device may serve to keep the mine clear of water. Such contrivances have been used at coal mines where local deformations of the strata cause water to accumulate in basins during the interval between the driving of entries and rooms and the final robbing of the pillars.

The accompanying sketch shows how a siphon may be installed at a metal mine where the conditions of dip and fall make the method feasible. It is best to use $1\frac{1}{4}$-in. pipe as a minimum size, to avoid clogging. At the lower end of the outlet pipe, which should extend well below the level of the lowest point to be drained, a common plug valve, *A*, should be provided. If rigged with a device to operate it with a wire or cord from the mine entrance, so much the better. In a cold climate the outlet leg of the siphon should be put in a trench and covered as a protection against freezing.

At the highest point of the siphon another plug valve, *B*, is required, so arranged that the siphon may be "primed" by filling it with water, ample provision being



SECTION AND DETAILS OF SIPHON DRAINAGE

made for the escape of air as the water enters the system. Almost any skillful mechanic can work out the details according to local conditions and materials available. A good combination is to put an elbow connection on each leg of the siphon and to connect them with short nipples, a tee and a union. The priming valve is connected with the tee by a short length of pipe. Another valve, *C*, or a check valve above *D*, should be put on the leg of the siphon inside the mine, at least six to nine feet below the priming valve. At the lower end of the intake a strainer, *D*, of some sort is advisable, to prevent clogging of the system with mud or rubbish. If there is much sediment in the water it may be conve-

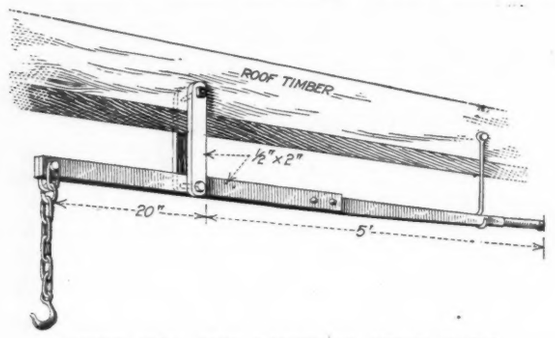
*Hermanville, P. E. Island.

nient to use a combination of rubber hose and wood float, as indicated.

To start, close valves *A* and *C* and open valve *B*. Fill pipes with water at funnel above valve *B* until no more air bubbles out and then close valve *B*. Open valves *A* and *C* and watch for results. If the joints are not perfectly tight air will accumulate at *B* and action will finally cease. When once adjusted the system will take care of itself until air or obstructions entering at *D* stop the flow. Clogging of the strainer may be remedied by leaving valve *C* open, closing valve *A* and suddenly opening valve *B*. If this does not work, uncouple the union and do the obvious thing.

Mine Car Dumping Device

At one mine where heavy end-dump cars are used for haulage there was a practice prevalent among the trammers of rapidly running the cars down to the ore bins in order to make use of the momentum in dumping. The jar of sudden stopping tended to make the car "buck," and thereby greatly reduced the personal effort of the trammers while unloading. This sudden stop-



LEVER FOR END-DUMPING MINE CARS

ping of the heavily loaded cars had a tendency to shear the rivets, ruin axles, and otherwise needlessly damage the cars. In order to cut down the cost of repairs, and at the same time facilitate unloading for the men, the dumping lever shown in the illustration was introduced. Its construction is simple and but little detailed description is necessary. By its use a car is run down grade gently to the orebins, the hook is fastened under the car, the lever pulled downward, and the car dumped with comparatively little effort. When not in use, the end of the lever is suspended out of the way over a light hanger. Any mine blacksmith can make this equipment in less time than it will take him to repair one badly damaged car.

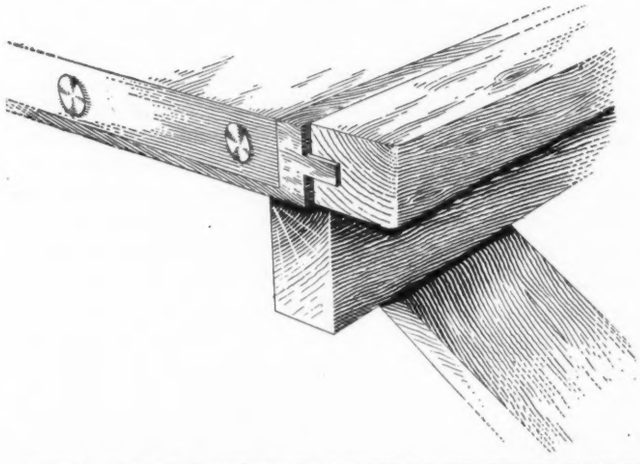
Underground Drill Rack

The use of hollow steel in rock drilling has brought with it many disadvantages, one of which is the tendency of the water-hole to become plugged with sludge and grit, says the *South African Mining Review*. When this happens, it causes a delay to the miner, who usually tries to clear the hole and use the drill if possible. When he is not successful, which is often the case, it means that the drill cannot be used until it has been returned to the blacksmith shop, cleared and sent down again. When a large number of drills are to be sharpened, the fact that a drill is plugged, but not dulled, will escape the notice of the man at the forge, and the result is an entirely superfluous resharpening and retempering of the steel. Such complications add to the expense of operating rock drills when this kind of steel is used. There are various ways by which hollow steel becomes plugged. The chief source of trouble is the manner in which it is handled underground. A trip through the mine will show a surprisingly large number of drills lying around in the dirt. This affords an excellent opportunity for material to lodge in the hole, causing it to choke. Miners, for convenience, will stand their drills in a row along the wall, thereby facilitating the entrance of dirt in the end standing on the ground. It would seem impossible to prevent this evil unless suitable racks are provided.

A rack, consisting of two poles fastened together at the top with a bolt and properly distanced at the base by a board, has been designed, and by its use the number of plugged drills may be materially reduced. The iron pins on which the drills are supported are driven into holes previously bored in the poles and can be made of scrap material. The distance board at the base has a large hole bored at each end, which permits the board to slip down over the bottom pins of each pole. The whole rack can be easily and cheaply built and may be taken apart by removing the bolt and slipping off the baseboard. This makes it a one-man job to move from one place to another. Drills of different lengths may be kept separate, and the bits and shanks can be inspected without picking up each drill. This saves time for the miner and facilitates the work of those responsible for the distribution and care of drills.

Fastening Paper or Tracing Cloth to the Drafting Table

Fastening drawing paper or tracing cloth to a drafting board or table seems a small detail and hardly worthy of consideration, but the method shown in the illustration will not only often benefit the appearance of



METHOD OF FASTENING DRAWINGS TO DRAFTING TABLE

a drawing, but will prevent the removal and replacement of thumb tacks each time they are in the way of the T-square, straight-edge or triangles. The paper or tracing should be cut to a size that will permit a margin to be folded over the edge of the drawing table, and the thumb tacks can be placed in the end of the drawing board or table, as shown in the sketch.

Correspondence and Discussion

Use of Powder in Opencut Blasting

I have read with considerable interest the article on "Use of Powder in Opencut Blasting," by E. S. Jacobson in the *Journal* of Feb. 23. His experience and results are so widely at variance with those I obtained in rock blasting in the United States that it is astonishing. I agree with Mr. Jacobson that the placing of holes is of prime importance in any kind of blasting, but from many years' experience in blasting all kinds of materials with every known explosive all over this country I have yet to see any such spacings as suggested by Mr. Jacobson. For instance, he states that vertical holes in rock should be set back from the face a distance equal to two-thirds of the depth of the hole and the distance between holes should be the same as the depth. Mr. Jacobson apparently refers to tripod drill holes, but it is rare that holes 30 ft. deep are made with this class of drill, owing to inconvenience of handling and dressing this length steel.

We use in this country the churn or well drill for drilling holes 30 ft. or more in depth. Usually, for rock, drills with 5½ to 5⅝-in. bits are used. It is a common thing with us to have holes 100 ft. deep and over, and I know of many places where holes from 125 to 175 ft. deep are carried. According to Mr. Jacobson's theory a 100 ft.-well hole should be set back from the face 66 ft. and holes should be 100 ft. apart. A 175-ft. hole would be 115 ft. back and 175 ft. between holes. Such spacing is preposterous. It couldn't be done.

Mr. Jacobson again assumes that "springing" can be done in all cases. This is not according to my experience, as the nature of the rock, direction of strata, etc., preclude this practice in most cases. In blasting well drill holes, springing, even if possible, is rarely resorted to.

In quarry work, which is the best example of opencut blasting, it is necessary to distribute the explosive along the bore hole in order to get proper fragmentation, so that placing all the explosive in the bottom, while it may pull out the rock at grade, does not assure a good breakage of the upper layers. I do not think that a 30-ft. hole will break 15 ft. either side of itself in most rocks or a 100-ft. hole 50 ft. each side. I have shot as many as forty 100-ft. holes at one time, using 60% and 40% dynamite, and know that the fragmentation was not anything out of ordinary. An average spacing for 100 ft. 5⅝-in. hole with us in limestone is about 18 ft., and 25 to 28 ft. back from the face. A 30-ft. hole would be set about 15 ft. back and 12 ft. between holes. A good spacing for holes 80 ft. in depth would be 17 ft. apart and 25 ft. back. It is not considered good practice to spring well drill holes at all in quarry work.

In certain quarries in this country we use what is known as the snake hole method of drilling. By this method holes are drilled horizontally at the bottom of a face of rock from 25 to 30 ft. deep and sprung heavily. Holes are spaced not more than 10 ft. apart, and about 50 to 60 ft. is the maximum height of face consistent with efficiency. It is necessary to spring the holes in limestone from four to six times in order to get a chamber large enough to hold from 200 to 250 lb. of powder. In trap rocks more frequent and heavier springing is necessary. This method works well, but we cannot space holes as indicated by Mr. Jacobson.

According to Mr. Jacobson, he gets about 10 tons of stone per pound of explosive (dynamite) used. I have made a study of this subject for years, and I know from data gathered all over this country that the average breakage is about five tons of stone per pound of explosive. In many operations four tons per pound is considered satisfactory. I do not think that any definite rule can be given for spacing holes. Everything depends on the local conditions, the hardness, direction of strata, thickness of ledges and purpose for which used. In drilling well drill holes it is customary to drill three to four feet below the quarry floor in order to assure a clean pull to the grade desired and make access of shovel easier. I do not think placing holes below grade reduces the amount of block holing. Block holing, as we understand it, is breaking up the huge pieces of stone, too large to go through shovel dipper or crusher opening. For this purpose, rotating hammer drills are largely used for making holes and a low-grade dynamite for blasting, the whole operation being known as secondary treatment.

The results obtained by Mr. Jacobson are remarkable, to say the least, and I conclude that the material being worked and results obtained are exceptional.

S. R. RUSSELL.

E. I. du Pont de Nemours & Co., Wilmington, Del., Feb. 26, 1918.

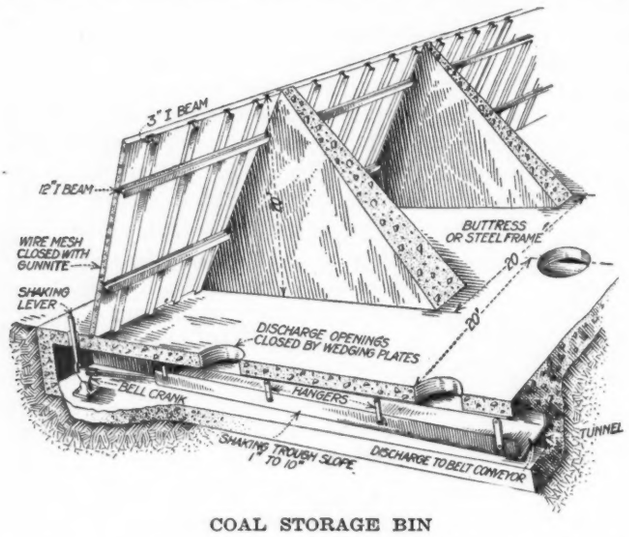
Storage of Coal

In a paper presented at the February meeting of the A. I. M. E., C. M. Young gave the results of certain experiments and observations upon the proper storage of bituminous coal. He pointed out the limitations caused by the heating of the coal when stored and contributed the valuable suggestion that by the admixture of lump with fine coal heating can be controlled. Mr. Young showed that if air can be excluded from the coal or reduced in amount there will be less heating. The storage of coal under water was touched upon, but the possibility of other methods for excluding air received no mention. Pursuing the thought that the exclusion of the oxygen of the air is the vital element in the storage of coal, it occurs to me that a gas could be substituted for water and that by this means the difficulties of storage under water might be eliminated. Two gases suggest themselves, carbon dioxide and sulphurous acid gas. Both of these gases are heavy enough to displace

air. Of the two, carbon dioxide is the one which promises most, both because it can be cheaply generated and for the reason that it is less objectionable than the sulphurous acid gas.

The quantity of carbon dioxide required to fill the interstitial space in coal is comparatively small. If we assume an interstitial space of 20 cu.ft. per ton of coal, it will require 3 lb. of carbon dioxide to fill this volume, which weight of carbon dioxide could be generated from 7 lb. of limestone and 4 lb. of hydrochloric acid, and the cost would be nominal.

It is evident that it would be impracticable to use carbon dioxide in the case of open heaps. To construct bins or bunkers of the ordinary type that would be sufficiently gas-tight to prevent a reasonable loss of gas would be prohibitive in cost. Such being the case, a type of bin departing from usual practice is suggested. A bin to



COAL STORAGE BIN

meet the requirements of the case should be exceedingly simple in structural elements and low in cost. These conditions could be met by the use of light side walls inclined at a slope approximating the angle of repose of piled coal. These side walls would be constructed of steel mesh imbedded in from 1½ to 2 inches of cement applied by a cement gun, the thin walls to be supported by light structural steel and this in turn supported by reinforced concrete buttresses (or steel frames) which would divide the bin into bays 20 ft. wide. The bin would be placed upon the ground and a concrete floor laid to cover the entire bottom.

To provide for the reclaiming of the coal, a tunnel would be constructed under each bay. Openings through the floor of the bin, provided with cast-iron doors of gas-tight construction, would communicate with the tunnel. In each tunnel a suspended trough would be placed below the line of openings. The trough would be sloped and provided with a reciprocating mechanism to facilitate the delivery of the coal to a collecting belt conveyor, which would be placed in the center of and transverse to the length of the bay. The belt conveyor would deliver to an elevator, which would discharge into loading bins placed at such a height as to secure convenient discharge into motor trucks or other vehicles. The filling of the bin could be accomplished from a bridge constructed along the center line of a series of bays or by means of conveying appliances.

For the operation of the shaping troughs beneath each bay, a car carrying an ordinary machine drill, operated by compressed air, could be used. This car would be shifted from bay to bay as required, and attachment would be made to each shaking bar. A compressed-air main would be required on each side of the bin. Significant features of the bin are shown in the sketch. Other methods for reclamation are also available.

To provide for the introduction of the gas a gas main would be placed close to the center line of each bay and a number of outlets at symmetrical points provided. Connecting with the main would be a delivery pipe which would extend from a central generating plant.

Assuming a width of bay of 20 ft. and a ground length of 120 ft., the approximate storage capacity for a height of 20 ft. would be 1000 tons. The ground area required would be 3 sq.ft. per ton of storage capacity. The cost of construction, roughly approximated and including all features except the central bridge and the gas system, would be $3400, or $3.40 per ton of storage. For a pile 40 ft. high, 2 sq.ft. ground area per ton of storage capacity, and a cost of $3.15 per ton of storage capacity, are obtained.

If an annual depreciation of 10% and an interest charge of 10% be assumed, the cost of storage per year is estimated as follows for the 20 ft. pile:

Depreciation and interest	$0.68
Interest 10% on coal at $5 per yr	0.50
Unloading and loading	0.30
Depreciation and interest on bridge	0.20
Land rental 10c. per sq.ft.	0.30
Total	$1.98

For a 40 ft. pile, the estimate is $1.58, including all of the items given in the estimate of the 20 ft. pile.

In gassing the pile, the bin would first be partly filled before the introduction of the gas. As the bin was filled, the gas could be gradually introduced. After completely filling, a top layer of fine coal would be spread evenly over the whole surface so as to prevent diffusion of the gas as much as possible. Over the top a waterproof tarpaulin or roofing felt could be securely placed. At intervals more gas could be forced into the pile, so as to compensate for losses.

In the estimate I have not included the cost of the top covering nor of the gas. The type of bin suggested would prevent leakage, and diffusion at the top would be greatly retarded. The top area of the bin for a 20 ft.-pile would be 1.6 sq.ft. per ton of storage capacity and for a 40 ft. pile, 0.5 sq.ft. The superior advantages of the 40 ft. pile are obvious. The costs given are tentative only. I know of no example of the use of carbon dioxide in the way described and believe the plan to be feasible. There is an additional fact that makes the use of carbon dioxide as a submergence agent especially advantageous. Both oxygen and carbon dioxide are adsorbed by carbon, but the latter is more readily adsorbed and in greater relative quantity at a given temperature than the former. It can therefore be inferred that the carbon dioxide adsorbed by carbon would displace any adsorbed oxygen. Without much doubt adsorbed oxygen plays an important part in spontaneous combustion. Whether coal would be as energetic in adsorbing carbon dioxide as pure carbon must be experimentally determined. G. J. Y.

New York, Mar. 9, 1918.

The Assayer and Chemist

Quantitative Analysis of Bismuth in Lead Bullion

By Douglas W. Jessup*

In the various methods of determining bismuth in lead bullion, difficulties are met that cause low as well as variable results. In a well-known method the bullion is dissolved in dilute nitric acid, nearly neutralized with NH_4OH and a few drops of HCl added to make a preliminary precipitation of BiOCl. But the chlorides of various metals such as Ag, Sb and Pb will precipitate and utilize some HCl. Thus if there is insufficient HCl present, the bismuth will not be completely precipitated. If there is an excess of HCl, the solution will be too acid, causing partial or no precipitation. Other methods suggest the solution of the bullion in HNO_3, addition of H_2SO_4 and filtering the solution from the $PbSO_4$. But the heavy amount of $PbSO_4$ retains the bismuth, and it is difficult to separate the two.

In the final precipitation of bismuth as oxychloride, there seems to be a point of chemical equilibrium that is difficult to obtain. For example: Bismuth sulphide is dissolved in HNO_3 and nearly neutralized with NH_4OH; if the bismuth is present in appreciable quantity, it will precipitate as a hydrate of variable composition before the neutral point is reached, which will change only partially to oxychloride with the addition of HCl, thus giving doubtful results. With limited amounts of bismuth, the neutralization point must be carefully watched. An accurate indicator is therefore required; otherwise with an excess of acid, no precipitate of BiOCl may form.

Good Results Obtained by Method Detailed

The following procedure varies somewhat from other methods and gives more constant results: Weigh five grams of lead bullion shavings, or, preferably, filings, into a No. 3 beaker or 8-oz. copper flask. Add 60 c.c. of dilute HNO_3 (four parts of water to one part HNO_3) and heat slowly until the bullion is in solution. Remove, add 15 c.c. H_2SO_4 and take to fumes. Then heat directly over a blast lamp for a few minutes, agitating the beaker with a rotary motion. The application of the intense heat will keep the bismuth sulphate in solution. Cool slightly, add about 40 c.c. hot H_2O, agitate and decant rapidly through a filter. To the $PbSO_4$ in the beaker add 10 c.c. H_2SO_4, 40 c.c. hot H_2O, agitate and decant. Again add 10 c.c. H_2SO_4 to the precipitate, take to dense fumes directly over the blast lamp and treat as before, washing with H_2SO_4 and hot H_2O. It is absolutely essential to filter the solutions hot and rapidly to insure complete separation of the bismuth from the lead sulphate. A sample of more than five grams can be analyzed, but there is greater difficulty in separating the bismuth from the lead sulphate.

*United States Smelting Co., Midvale, Utah.

The acidity of the filtrate will be too great by this time and should be partly neutralized with NH_4OH, leaving about 10 c.c. H_2SO_4 in excess. Pass in a rapid current of H_2S for 10 or 15 min. to precipitate the second group of sulphides, filter and wash. Rinse the sulphides back into the beaker, add three grams of sodium sulphide, preferably the monosulphide, boil a few minutes to remove antimony and arsenic, filter through the same filter and wash with H_2O. Repeat the operation, boiling the remaining sulphides with two grams of KCN for 15 min. to dissolve silver sulphide and traces of antimony, if any; filter through the same filter and wash. If there be but little antimony in the bullion, boiling with sodium sulphide may be omitted. Only the sulphides of bismuth, lead and perhaps some silver now remain.

Dissolve these sulphides in 10 c.c. dilute HNO_3 (one to one), heat until the separated sulphur is clean, filter and wash through the same paper. If the sulphides are present in small amounts, they may be dissolved directly on the filter paper. Take the nitrate solution to dryness, but do not bake or allow to spit; this will render it unnecessary to add NH_4OH to neutralize free acid. Add three or four drops of HCl and a few drops of H_2O to take the dried salts into solution, dilute to 500 c.c. with warm H_2O and keep over night at a warm temperature. Decant, heat slightly to dissolve any lead chloride, filter through a weighed Gooch crucible and dry at 100° C. Cool, weigh as BiOCl and multiply by 0.8017 to obtain the theoretical value of bismuth. A standard sample of known composition is analyzed for bismuth in conjunction with the regular samples. If any loss of bismuth occurs, a corresponding correction is made in the bullion determination.

Determination of Bismuth as Basic Carbonate

Bismuth may also be determined as basic carbonate instead of oxychloride, provided no other metals are present that will precipitate with it. The solution containing the bismuth nitrate is partly neutralized with NH_4OH (producing no precipitate) and a slight excess of $(NH_4)_2CO_3$ added. Heat, filter and wash through a weighed Gooch crucible, ignite at a dull red heat. Cool and weigh as Bi_2O_3, multiply by the factor 0.8965 to obtain the true bismuth weight. If a large quantity of silver is present in the bullion, the solution of silver by KCN may be incomplete; if so, an excess of HCl is added to the dried bismuth nitrate, the AgCl filtered, the solution taken to dryness and the above method continued.

Bismuth in Slags

Weigh 20 grams of finely pulverized chilled slag into a 500-c.c. beaker, add 150 c.c. hot H_2O and agitate. While the slag is in suspension, add 30 c.c. HCl and continue agitating until the slag is dissolved. Dilute to 500 c.c. with hot H_2O; if slag has gelatinized begin over again. There may be some particles of slag that have

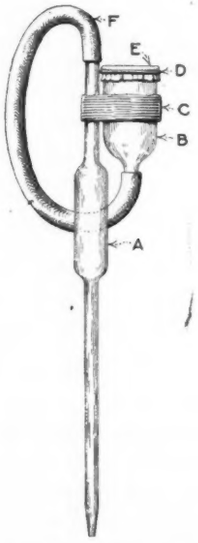
not been dissolved; if so, heat may be applied or the solution filtered, the residue treated with HCl and taken to fumes with H_2SO_4. It may be necessary to fuse the residue. The filtrates from these operations are added to the original solution.

A rapid current of H_2S is immediately passed through the 500-c.c. solution of slag, the precipitated sulphides filtered, dissolved in 10 c.c. dilute HNO_3 and fumed with 5 c.c. H_2SO_4 to separate the lead. The solution is filtered and treated with H_2S. The determination is completed as in working on bullion.

To determine bismuth in ores, decompose five grams of ore with HNO_3, HCl, H_2SO_4 and take to fumes, heat directly over a blast lamp and proceed as in the method for bismuth in bullion.

Pipette for Fuming Liquids

The pipette described by R. C. Cook in *Chemist Analyst* for October, 1917, is intended for use in handling fuming liquids. It consists of a pipette (*A*) of the desired size, a filter tube (*B*), a large rubber band (*C*), a small rubber band (*D*), a strip of dental rubber (*E*), and a short length of flexible rubber tubing (*F*). If a filter tube is not at hand a test tube may be drawn out in the form shown or a broken 25 cc. or 50 cc. pipette will make an admirable substitute. The diaphragm (*E*) is made of two thicknesses of dental rubber held in place by the small rubber band (*D*). (*A*) and (*B*) are



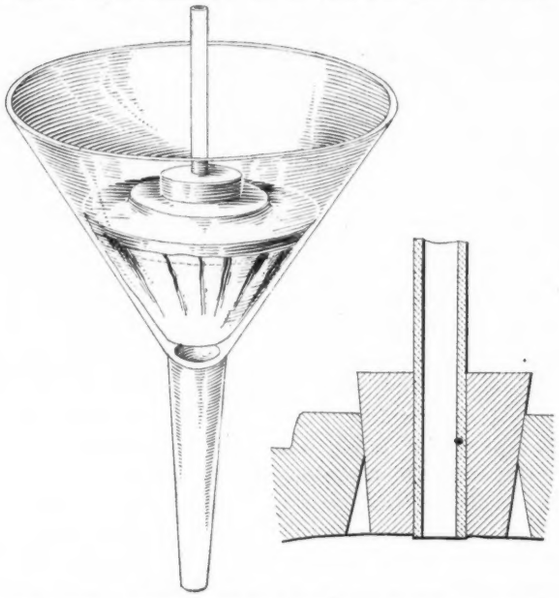
PIPETTE FOR HANDLING LIQUIDS

rigidly fastened together by the large rubber band (*C*). By attaching the rubber tubing as shown the apparatus is complete.

Its manipulation is accomplished by working the diaphragm with the forefinger, meanwhile holding the device between the thumb and middle finger. Air is forced out by pressure on the diaphragm, the liquid being drawn up into the pipette upon release. Repetition of this procedure enables one to wash the pipette out thoroughly each time before taking the sample. The pressure applied to the diaphragm is made great enough to cause the acid to rise above the thread line upon the pipette. The liquid will be found to fall of its own accord, and as it reaches the thread line the pipette is sealed by placing the finger firmly upon the rubber tubing at the top (*F*). The end of the pipette is wiped off with tissue paper and the sample delivered by raising the forefinger and pressing the diaphragm. With careful use the rubber diaphragm will last for weeks, and its replacement requires only a few minutes' time.

Device for Hastening Filtration

Rapid filtration is largely dependent upon keeping the stem of the funnel filled with liquid. When it does not fill quickly, a combination of a No. 7 rubber stopper, fitted with a short glass tube, with a Bailey crucible holder for Gooch crucibles, may be used to hasten the operation, according to R. R. Turner in the *Chemist*



WITH THIS DEVICE, FILTRATION MAY BE QUICKENED

Analyst for October, 1917. By holding this device firmly against the inside of the funnel above the filter, and blowing gently through the tube, a steady, regulated pressure may be applied, which will generally accomplish the result. The effect is the same as if gentle suction were used without the considerable trouble of changing to a suction flask. The arrangement fits in an ordinary filter funnel without touching the filter, if the latter is not larger than the 11 cm. size. The slight concavity of the lower side serves not only to avoid contact with the solution but also assists in securing a tight joint.

Purification of Mercury

A method of purifying mercury is described by H. B. Dunnicliffe, in *Chemical News* (abstr. *Journ. Soc. Chem. Ind.*). The mercury is distilled slowly from an ordinary glass retort supported with its neck vertically downward on a retort stand. Through the tubulure of the retort, the stem of a dropping funnel suitably bent and a piece of glass tubing are passed, and packed in place by means of asbestos. The neck of the retort passes through a perforated glass cover into a glass beaker, and a sheet of asbestos board is placed between the retort neck and the Fletcher burner. Asbestos paper is placed over the retort to prevent loss of heat. The mercury is fed into the retort at about the same rate as it distills (about an ounce in four minutes).

Events and Economics of the War

The long-expected offensive of the Germans on the Western front began on the morning of Mar. 21 after a few hours' bombardment. The attack was concentrated against the British on a 50-mile line from Croisilles to La Fère. Upon the failure of their line near St. Quentin, the British fell back, though more and more slowly, to a line west of Noyon, Roye and Peronne in the south and resting on Arras in the north. The Germans have suffered enormous losses. Violent artillery duels are reported on the French and Italian fronts. As a condition of peace, Germany has demanded that Rumania give up all munitions of war. The British bombarded Ostend and sank two German destroyers and two torpedo boats off Dunkirk.

In the United States, drastic restrictions in imports were ordered by the War Trade Board, to take effect on Apr. 15; 350,000 tons of shipping will thus be saved, it is believed. Dutch ships in American waters were seized on Mar. 20 by order of the President. A bill providing for the seizure of any private property, as a war measure, was offered by the War Department. The House passed the War Finance Corporation bill on Mar. 21. An amendment to the Agricultural Appropriation bill, fixing $2.50 per bu. for the 1918 wheat crop, was passed by the Senate. The U. S. destroyer "Manley" collided with a British war-ship. Announcement was made that the Third Liberty Loan issue will be for $3,000,000,000 and will bear 4¼% interest.

Government Commandeers Platinum

The Council of National Defense announced on Mar. 1, 1918, that through Ordnance Requisition No. 510 from the Secretary of War, the Government has taken over control of the production, refining, distribution and use of crude and refined platinum for the period of the war. The control will be exercised through the chemical division of the War Industries Board. The division on the same day sent out requests to the industry for inventories of the existing stock of crude and refined platinum, and platinum-iridium alloys as of Mar. 1, 1918.

The letter stated that it was not the intention of the Government to take over and handle directly the present stock of platinum, but to permit its shipment by the producers or dealers subject to certain conditions. Upon the fixing by the Secretary of War of a reasonable price for crude, refined, and alloyed platinum, notice will be given and blanks issued governing delivery and distribution. The letter included the following directions to producers:

1. That producers, refiners and dealers in platinum continue to dispose of their product for Government purposes, and for that only as directed by the chemical division.
2. That producers, refiners and dealers in platinum who are also consumers use platinum for Government purposes and for that only, as directed by the chemical division.
3. That all obligations arising out of transactions in the production or delivery of crude, alloyed or refined platinum released as above, including all claims for shortage, poor quality, damage or loss in transit, be borne by the producer or seller, as the case may be, in accordance with existing trade practices.

Distribution may be made by consent of this board through agencies under existing arrangements, provided that there results no increase over the existing price to the user.

The council, on separate application in each case, will consider permitting the delivery of a limited amount of platinum for essential commercial purposes not for Government account.

Proper blanks upon which application for release of shipment should be made will be furnished on application.

The following list indicates, in general, the order of preference which will be followed in releasing platinum for shipment: First, military needs of the U. S. Government; second, military needs of Allied governments; third, essential commercial purposes.

The council issued a second statement on Mar. 2, to the effect that requisition No. 510 does not apply to or interfere with the purchase by the consumer of any manufactured article containing platinum. This explanation was made that the public might clearly understand the purpose of this Government action.

Plans Completed for Zone System of Coal Distribution

In announcing completion of its zone system of bituminous coal distribution on Mar. 21, the Fuel Administration indicated that railroad embargoes would be used to enforce operation of the plan. Roughly outlined, the zones are:

Mines in Missouri, Arkansas, Kansas, Oklahoma, and Iowa will supply Nebraska, Texas east of the Pecos River, and Louisiana west of the Mississippi.

Lake Michigan and Lake Superior coal docks will supply the Dakotas, Minnesota, the upper peninsula of Michigan, and Northern Iowa and Wisconsin.

Illinois will supply, from Apr. 1 to Sept. 30, Illinois, Wisconsin, Minnesota, South Dakota, Iowa, Missouri, Arkansas, Louisiana, Tennessee, Kentucky, Indiana and Michigan, and from Oct. 1 to Mar. 31, Wisconsin, Iowa, Missouri, Arkansas, Louisiana, Tennessee, Kentucky, Illinois, Indiana, and Michigan.

Western Kentucky fields will supply Kentucky, Tennessee, Mississippi, Arkansas, Louisiana, Texas, Illinois, Wisconsin, and Indiana.

Virginia, Southeastern Kentucky, and Tennessee will supply Kentucky, Indiana, Ohio, and the lower peninsula of Michigan.

Indiana will supply Illinois, Kentucky, Wisconsin and Michigan.

Tennessee, Georgia, Kentucky, and Virginia will supply the Carolinas, Georgia, Tennessee, Alabama, Virginia, and Florida.

Alabama will supply Louisiana, Mississippi, Alabama, Georgia, Florida, east Texas, Arkansas, and west Tennessee.

Ohio will supply Ohio, Indiana, and Michigan.

West Virginia high volatile fields will ship to West Virginia, Ohio, Indiana, the lower peninsula of Michigan, Kentucky and Virginia.

West Virginia low volatile fields will ship to District of Columbia, North Carolina, Virginia, Kentucky, Ohio, West Virginia, South Carolina, and Lake Erie ports for transshipment only.

Pennsylvania, Maryland, and northern West Virginia will ship to West Virginia, Maryland, District of Columbia, Delaware, Pennsylvania, New Jersey, New York, New England, and Lake Erie ports for trans-shipment only, except that Pennsylvania mines may ship as far west as Wellington and Lorain, Ohio.

Montana, Wyoming, Colorado, New Mexico, Utah, Washington, and Oregon will supply the Rocky Mountain and Pacific Coast states, except that the mines east of the Rockies may ship also to Missouri Valley points to supply the summer demand.

The new order goes into effect on Apr. 1. Realizing that certain industries will be unable to obtain coal from the mines upon which they have drawn in the past, the Fuel and Railroad administrations issued the following statement to such consumers:

The patriotic coöperation of the many interests and individuals who may be affected by this culling out of unnecessary transportation is confidently hoped for. When a consumer finds that he no longer has the opportunity to get his coal from a distant mine, according to his custom, it is hoped that he will realize that his using another sort of coal is an essential part of the scheme of conservation in the interests of national defense.

When a coal producer finds that he no longer has a market to which, in the past, regardless of the unnecessarily long haul, he has sent his coal, it is hoped he, too, will realize that the resulting adjustment of his business is in the national interest; that there will be more cars and locomotives and transportation energy to transport more coal from his mines to the markets he can reach within his zone; and that his business in consequence should be increased rather than diminished.

Will Abrogate Private Oil Contracts If Necessary

Mark L. Requa, director of the oil division of the U. S. Fuel Administration, announced on Mar. 20 that whenever the Government deemed it necessary private contracts would be abrogated and producers ordered to supply oil to indicated industries, regardless of whether a given industry held a contract or not. The priority list is to remain about the same. Class 1, however, was amended to read "railroads and bunker fuel and oil refineries using or making fuel oil."

At a conference with refinery men on the day following, Mr. Requa, when asked if the pooling of pipe lines were contemplated, would only say that the situation was being considered from the standpoint of the greatest efficiency in transporting and distributing oil for war needs. It is estimated that coördination of pipe lines would increase deliveries at tidewater by about 20,000 bbl. a day. The oil-burning ships to be built this year are expected to require 90,000 bbl. a day, so that at the end of the year, allowing for a small increase in American production, and the normal supply from Mexico, oil consumption in this country will run ahead of production 73,000,000 bbl. a year, compared with 35,000,000 bbl. excess estimated by A. C. Bedford for 1917.

Conscientious Objectors Provided For

To enable conscientious objectors to war to serve the country when called in the draft, the President declared in an executive order issued on Mar. 21 that the following military service is non-combatant service:

1. Service in the Medical Corps wherever performed.

2. Any service in the Quartermaster Corps in the United States may be treated as non-combatant. Also, in rear of zone of operations, service in the following: Stevedore companies, labor companies, remount depots, veterinary hospitals, supply depots, bakery companies, the subsistence service, the bathing service, the laundry service, the salvage service, the clothing renovating service, the shoe-repair service, and transportation-repair service and motor truck companies.

3. Any engineer service in the United States may be treated as non-combatant service. Also, in rear of zone of operations, service as follows: Railroad building, operation, and repair; road building and repair, construction of rear-line fortifications, auxiliary defences, etc.; construction of docks, wharves, storehouses, and of such cantonments as may be built by the corps of engineers; topographical work, camouflage, map reproduction, supply-depot service, repair service, hydraulic service, and forestry service.

War Cabinet To Meet Weekly

The heads of the six recently created independent war bureaus were called into council with the President on Mar. 20 for the first time. Becoming convinced that there was something behind the frequent reports that the work of these bureaus was not closely coördinated, in many instances, says the *Sun*, the President summoned the heads to the White House for a general discussion and understanding. The conference was attended by Director General of Railroads McAdoo, Chairman Hurley of the Shipping Board, Chairman Baruch of the War Industries Board, which is to be given wider powers; Chairman McCormick of the War Trade Board, Food Administrator Hoover and Fuel Administrator Garfield.

As a result of this preliminary meeting, a permanent "War Cabinet" is to be formed to meet each Wednesday at the White House. It will have as its membership the men who attended the conference. Each of them left the conference convinced that much good would result from a common understanding of war problems. The rail and water transportation lines can be brought closer together, and one will know the limitations of the other in allocation of ships and freight cars. The War Trade Board, the Food and Fuel administrations and the War Industries Board that must furnish the munitions where they are needed will know the limitations and demands of other branches.

Price-Fixing Committee Appointed

Under the authority of the War Industries Board, a price-fixing committee has been appointed whose duties will be to pass upon prices for all basic raw materials and to establish from time to time a price-fixing policy, to be submitted to the President for approval. Any of the executive departments having difficulty in the handling of price-fixing matters will have the advice and assistance of the committee when desired.

The object of the committee is twofold: First, it will be a separate body, quasi judicial in nature, for the purpose implied in its name, which it will serve through being made up of men separated so completely from industrial interests that their motives and actions in the determination of prices can be subject to no suspicion of mercenary interest. Prices will not be made until after costs have been passed upon by the Federal Trade Commission. With costs as a basis, the committee will then consider problems of production and distribution

before arriving at its decisions. The second object to be achieved by the committee is speed. It will sit all the time. The personnel of the committee is as follows: Robert S. Brookings, of the War Industries Board, chairman; Brig. Gen. Palmer E. Pierce, surveyor general of supplies for the War Department; Paymaster John Hancock, of the bureau of supplies and accounts of the Navy; Dr. H. A. Garfield, Fuel Administrator; F. W. Taussig, chairman of the U. S. Tariff Commission; W. J. Harris, chairman of the Federal Trade Commission; Hugh Frayne, of the War Industries Board; and Bernard M. Baruch, ex officio. Another civilian member of the committee will later be appointed.

McAdoo Restricts Railway Expansion

Director McAdoo's first act, after the signing of the Railroad bill on Mar. 21 by the President, was to issue an order restricting railroads' capital expenditures to extensions and betterments absolutely essential under war conditions. A division of capital expenditures had already been created in the Railroad Administration by Mr. McAdoo, under the supervision of Robert S. Lovett.

This division will scan all requests for the building of new terminals, extension of lines, purchase of locomotives, cars and other equipment, and all other enterprises requiring expenditure of capital. Engineers of the Railroad Administration will report on the physical necessity of proposed betterments before these are considered by higher officials. After being approved by Mr. Lovett and the Director General, proposals involving capital expenditures will go to the division of finance and purchases, which is headed by John Skelton Williams, for execution.

Coal Trade Wants Binding Contracts

The order of the U. S. Fuel Administration issued on Dec. 24, 1917, regulating the making of contracts by operators, producers and jobbers of coal and coke is strongly disapproved of by the Wholesale Coal Trade Association of New York. It is directed in the order mentioned that no contract shall provide for the delivery or supply of coal or coke over a period longer than one year; that every such contract shall provide that the same shall be forthwith cancelled upon receipt of an order from the Fuel Administrator for such cancellation, and that every contract shall provide that coal or coke deliverable thereunder shall be subject to requisition by the Administration.

The association maintains that the second and third of the provisions mentioned above make a contract indefinite. It holds that a producer can give no assurance to the consumer of the quantity of coal that he will receive under such a contract. A resolution has been drawn up, therefore, by the association that the Fuel Administration be requested to modify the above-mentioned clauses so as to make it possible for the producer and owner of coal to make binding contracts with consumers and manufacturers, if necessary naming the essential consumers and limiting the quantity of coal to be sold to non-essential consumers in such manner as may be found needful and proper after investigation by the Fuel Administration.

Non-Essential Industries

Financial America, of Mar 11, publishes a list of non-essential industries which, in our last current year, produced $2,213,000,000 of goods. To these non-essentials, it adds $654,000,000 as the savings from reducing our production of automobiles 30 per cent. Some of the items in the list are:

Tobacco	$490,000,000
Malt liquor	442,000,000
Furniture	265,000,000
Silk goods	254,000,000
Millinery and lace	114,000,000
Jewelry	81,000,000
Musical instruments	75,000,000
Photographic apparatus	75,000,000
Artificial ice	60,000,000
Wool carpets and rugs	53,000,000
Fur goods	44,000,000
Corsets	41,000,000
Electric and other signs	39,000,000
Clocks and watches	25,000,000

Tobacco, artificial ice and corsets non-essentials? To say nothing of some of the others. Shades of our ancestors, no!

First Concrete Ship Launched

The steamship "Faith," the first ocean-going reinforced-concrete steamer built in America, was launched at a port on the Pacific, on Mar. 14. Six weeks from the day the concrete was poured into the forms, the boat took the water. The vessel is 320 ft. long, 44.6 ft. beam and 30 ft. deep and will carry 5000 tons of cargo. The launching was from a broad meadow, with none of the usual appurtenances except a spur track and a couple of construction sheds. It is the contention of the builders that concrete vessels can be built with no greater preparation, wherever land and water meet, and that material always is at hand or near-by.

Advantages claimed for the vessel are that concrete construction does not interfere with steel construction, as plenty of concrete can be had; concrete vessels can be built for the present cost of wooden vessels; concrete vessels of 7500 tons can be launched within 90 days after work starts, while the cost of the "plant" is "as $25,000 to $500,000" compared with a steel shipyard.

The Future of Russia

"Grave as the situation has become in Russia," writes the *Economiste Francais*, in discussing the fall in Russian bonds, "and strong as the probability is that the crisis will be prolonged, it is none the less reasonable to believe that a country so vast, and with such immense resources, will get itself in shape again."

Will repudiation of its debt by the present Russian government mean permanent repudiation? The *Cote de la Bourse*, of Paris, answers that "the Bolsheviki can no more suppress the law of credit than they can suppress the laws of physics. A state cannot do without credit, and it cannot obtain credit without being honest with its creditors. No state can exist permanently on a basis of bankruptcy, the Bolsheviki to the contrary notwithstanding."

Remember the Comfort Fund of the 27th Engineers.

Industrial News from Washington

By Paul Wooton, Special Correspondent

Restriction on Imports Affects Pyrites and Graphite

In order "to enable this Government to eliminate less essential imports, to the end that tonnage might be conserved and additional shipping be made available for the transportation of troops and supplies to Europe," the War Trade Board has published its first list of restricted imports. The minerals appearing on the list are asbestos, all acids, muriate of ammonia, all coal-tar distillates (except synthetic indigo), all salts of soda (except nitrate of soda and cyanide of soda), cryolite (except not to exceed 2000 long tons for the year 1918), explosives (except fulminates and gunpowder), fluorspar, infusorial and diatomaceous earths, nickel, graphite (no imports until July 1; thereafter not exceeding 5000 long tons for the remainder of 1918), pyrites (not exceeding 125,000 long tons to Oct. 1), and zinc.

The restrictions in mineral imports followed precisely the recommendations made by a committee composed of C. K. Leith, J. E. Spurr and Pope Yeatman, representing the Shipping Board, the War Trade Board and the War Industries Board.

Imports by rail from Mexico or Canada are not affected by the restriction. The exceptions under which licenses may be granted for the importation of articles contained in the list issued Mar. 23, known as list No. 1, are as follows:

(1) When the articles mentioned are actually shipped from abroad prior to Apr. 15, 1918.
(2) When coming by rail from Mexico or Canada when the goods in question originated in those countries or in others from which such goods are being licensed for import.
(3) When coming as a return cargo from European points and then only (a) when coming from a convenient port, (b) when loaded without delay, and (c) when the importation from Europe is not specifically prohibited in said list.

The action was not taken until all interests affected had had an opportunity to be heard. The State and Treasury departments also approved the recommendation. Pyrites and graphite are the only minerals on the list the importation of which, in large quantities, is affected. The imports of pyrites are restricted in graduated amounts, so as to allow the supplies of Spanish ore to decrease from month to month, in order that consumers in the United States may have time to change their practice to a sulphur basis

The restriction in regard to graphite applies principally to that from Ceylon. Very little has been coming from Madagascar in recent months. The usual imports from those sources aggregate 25,000 tons. At present, large stocks of imported graphite are on hand. Imports of graphite prior to Apr. 15, when the restricted list goes into effect, plus the 5000 additional tons which may be imported during the latter half of the year, will aggregate 13,000 tons, or approximately 50% of the usual imports of this material. Such supplies as may be necessary to make up this reduction can be had from domestic and Mexican sources, it is believed.

In view of the steps taken, it now is the duty of domestic producers to improve their product, as is set forth by Mr. Spurr as follows:

A great improvement in standardization of domestic graphite as to size and purity must be made before the Alabama product of flake graphite can win the confidence of the makers of graphite crucibles. In the past, this product has been so irregular, as shipped from the various producers independently, that there is considerable prejudice among some manufacturers against using any of the domestic supply, and all prefer to use as little as possible. The average manufacturer hesitates to adopt more than 20% in his formula, as compared with 80% Ceylon graphite. It seems clear that satisfactory crucibles could be made entirely from domestic graphite, except possibly some of small flakes, as this has actually been done, but it is entirely a question with the producers whether they can standardize their product as indicated.

The domestic producers now have their opportunity, and if they carry out their intentions as to quantity and quality, it is likely that the overseas import will be eliminated entirely, but if they fail to do so, it will be necessary again to license imports. In this connection, it has been suggested by some that the Alabama Graphite Association act as the selling agent for the southern field and see to it that nothing passes through its hands to manufacturer until inspected, sampled and guaranteed as to grade and analysis. Apparently this is a plan which might secure the desired standardization.

The restriction in imports comes just in time to prevent a number of Alabama mines from closing down. Such imports as are permitted in the future will be distributed by the Shipping Board. The embargo is complete on dust or amorphous graphite, which comes largely from Korea.

Housing Problem in War Industry

A great clamor has gone up from many communities for Governmental financial assistance in meeting the housing problem. In most cases, Federal inspectors report, the communities themselves are not coöperating fully in meeting the needs of the situation in centers of war industry. This has led to the following official statement:

If a community is benefiting through the fact that war orders are being placed among its manufacturers, and indirectly through the fact that a larger population is spending its earnings in that particular community, it is not unreasonable to ask that the community itself, in this war emergency, shall make an effort to help itself. There is reason to believe that where a community is overloaded with contracts, its chance for receiving additional Governmental contracts is remote, as it naturally would be useless to offer additional contracts to a community whose manufacturers are already unable to find housing for their workers.

May Standardize Wire Rope

Standardization of sizes of wire rope is being considered by the commercial economy board of the Council of National Defense. From such investigations as have been made, it is believed that the manufacture of several sizes of rope can be discontinued for the period of the war. Before any action is taken, however, the users of wire rope will be accorded ample opportunity to be heard and to offer any suggestions.

Remember the Comfort Fund

Tobacco is a non-essential, says a writer in *Financial America*. Apparently our friend's pipe is out. All he needs is a match. For him temporarily tobacco may be, as he says, a non-essential. But how about yourself and the men in the mining regiment? Consider this question when you come to the end of a smokeless day. How clear and blue it is! How clear that we must keep the men of the regiment supplied with tobacco and other comforts and how blue they will be if we don't! If you have not contributed to the Comfort Fund, you should do so without further delay. You will get the maximum pleasure out of your money. Try it and find out. Contributors to date are as follows:

Engineering and Mining Journal	$1000.00
New York Engineering Co.	1000.00
A Friend, Nov. 23	5.00
H. H.	5.00
D. E. Charlton	5.00
H. W. Hardinge	1000.00
Frank N. Spencer	5.00
W. L. Coursen	5.00
J. H. Polhemus	5.00
J. H. Janeway	10.00
Albert D. Beers	10.00
J. E. Hayes	10.00
J. A. Van Mater	25.00
L. Vogelstein & Co.	100.00
"Cuprite"	10.00
R. H. Bassett (Hanna Ore Mining Co.)	10.00
A Friend, Dec. 10	10.00
P. A. Mosman	10.00
American Zinc, Lead and Smelting Co.	100.00
J. G. H.	5.00
Daniel Guggenheim	100.00
A. H. H.	5.00
Willard S. Morse	25.00
August Heckscher	100.00
Anaconda Copper Mining Co.	1000.00
F. W. Bradley	100.00
Charles Le Vasseur	5.00
A Friend, Dec. 13	50.00
Freeland Jewett	10.00
Herman A. Wagner	5.00
Francis P. Sinn	10.00
R. C. Gosrow	5.00
D. C. Jackling	100.00
"V"	10.00
J. H. Brickenstein	5.00
E. E. Northrup	5.00
Rogers, Mayer & Ball	50.00
Denver Technical Staff, American Metal Co., Ltd.	30.00
A Friend, Jan. 9	100.00
E. B. Coolidge	10.00
J. V. N. Dorr	200.00
Pope Yeatman	50.00
W. H. Aldridge	50.00
C. E. Hart	5.00
Robert I. Kerr	5.00
Engineers of Washoe Smeltery, Anaconda Copper Mining Company	205.00
Harry C. Graham	25.00
Utah Copper, Nevada Consolidated, Ray Consolidated and Chino copper companies	1000.00
A Friend, Jan. 23	5.00
John Gillie	25.00
J. N. Houser	5.00
C. K. Lipman	50.00
Theodore Sternfeld	50.00
Clinton H. Crane	500.00
T. Wolfson	10.00
William H. Hampton	10.00
W. E. Merriss	10.00
J. Parke Channing	100.00
Miami Copper Co.	250.00
J. H. Means	10.00
C. W. Goodale	25.00
P. G. Beckett	50.00
F. R. Foraker	25.00
Charles A. Chase	25.00
E. Fleming L'Engle	5.00
Calumet & Hecla Mining Co.	250.00
H. G. Ferguson	18.00
Jay E. Van Gundy	10.00
Franklin Osborn	10.00
Oscar Lachmund	10.00
W. T. Swoyer	10.00
Interest	10.00
Quincy Mining Co.	100.00
American Metal Co.	250.00
William H. Fairbanks	25.00
D. E. Curry	5.00
W. R. Ingalls	50.00
H. A. Guess	25.00
J. Mc. C.	5.00
Engineers' Club of Northern Minnesota	85.00
B. B. Thayer	50.00
R. H. Sales	25.00
Albert C. Burrage	100.00
Edward H. Clark	25.00
P. Rutherford	5.00
Adolph J. Martinson	2.00
Frank R. Edwards	5.00
J. H. Munro	100.00
E. E. McCarthy	25.00
J. L. Bruce	15.00
D. Ford McCormick	10.00
Louis D. Huntoon	5.00
P. G. Spilsbury	10.00
C. T. Brown	10.00
M. C. M.	3.00
James F. McCarthy	50.00
United States Smelting, Refining and Mining Co.	250.00
L. O. K.	10.00
Herman A. Prosser	25.00
J. E. Johnson, Jr.	5.00
A. W. Hahn	5.00
L. D. Hudson	10.00
Lane Pearl	5.00
Arthur K. Adams	10.00
L. L. Wilcox	5.00
E. J. Longyear Co.	100.00
Pick and Shovel Club, Mining Department, Case School of Applied Science	11.00
L. S. Cates	25.00
J. M. Platt	25.00
A. L. Walker	5.00
C. G. Rothschild	10.00
General Engineering Co.	25.00
N. O. Lawton	10.00
F. R. Weekes	10.00
S. F. Shaw	10.00
Iowa Gold Mining and Milling Co.	50.00
L. L. Middelkamp	15.00
G. C. Townsend	10.00
Total	$9684.00

Back up the 27th Engineers. Little by little our forces at the front are getting into action. Soon the mining regiment will be in the thick of it. No matter what you have given to other things, make it just a little bit more. Make your check payable to W. R. Ingalls, treasurer. On account of the work involved in administering the Comfort Fund, acknowledgment of contributions is made only through publication in the *Journal*.

Minerals Separation Co., Ltd., *vs.* Butte & Superior

The suit of Minerals Separation Co. Ltd., against the Butte & Superior Mining Co., on appeal from the U. S. District Court of Montana was tried in the U. S. Circuit Court of Appeals at San Francisco from Mar. 8 to 11 inclusive. The action is an appeal from the decision of United States Judge George M. Bourquin, which holds that Butte & Superior have infringed upon the oil-flotation process owned by Minerals Separation, and that this infringement has been going on for the last five years. Butte & Superior contend that it is not using the fractional-percentage patent system, but has added petroleum in excess of 1% to its process. The patent depends on the use of a fractional part of 1% of oil, and Butte & Superior is using more than this in its process, and thus claims that it is not infringing upon the rights of the patentee, and declines to pay the royalties demanded by Minerals Separation. During the progress of the hearing before Judges W. W. Morrow and William H. Hunt of the Court of Appeals, laboratory demonstrations were made, using a miniature plant which had been exhibited in the Supreme Court. Minerals Separation Co. presented eight and Butte & Superior two demonstrations. The Minerals Separation tests were: (1) The well-known miner's pan or batea, using water and crushed ore. (2) The Everson process, in which the ore in the demonstration was mixed with oil, employing the pan or batea. (3) The Kirby process, known as oil flotation, taking the metal by the buoyancy of the oil and skimming through operating devices. (4) The patent in the suit at bar demonstrated for the purpose of showing it to be an idea entirely different from the ideas shown in the three prior experiments. Mixed Butte & Superior ore with water, added 0.1% oleic acid,

agitated the pulp and obtained the mineral air-bubble froth of the patent. Then added 3.6% oleic acid to show that too much frothing oil destroyed the process; again agitated the mass, and, instead of a mineral air-bubble froth, the recovery was in granules, not at the top of the mass but at the bottom, which is evidently a sinking process. (5) The Broken Hill process was demonstrated to show that the process of the patent is due to a frothing agent; used phenol and obtained the results of the patent. (6) Used kerosene, showing that it is not a frothing agent and therefore performs no service in the Butte & Superior mixture of oils. (7) Used a mixture of kerosene and fuel oil and claimed that no froth resulted from that mixture. (8) To show the pure kerosene does not froth, used 25% of kerosene and claimed to get practically no result. The two demonstrations presented by Butte & Superior were: (1) Used pine-tar oil and claimed that it is substantially the same in effect as the mixture used by this company; claimed that the use of 3.6% of pine-tar oil results in the froth of the patent. (2) Presented a miniature mill operation to show the process of the patent and demonstrate the use of mixed oils as applied by Butte & Superior. Hearing was concluded on Mar. 11 and decision reserved.

Precautions in Using Gasoline Engines and Handling Gasoline in Mines

In order to minimize the risk of fires, observe these precautions:

1. Keep open lights away from all gasoline cans or tanks, feed pipes, and engines.
2. Use only closed cans or tanks for carrying gasoline into the mine.
3. Use only a closed can, like an oil can, for priming with gasoline, and keep the can where it cannot be knocked over.
4. Never store more than five gallons of gasoline or as much more as is required for one day's work in the mine.
5. Do not let oily waste or rags lie in the engine room. Put them in a metal pail. Use sand to absorb oil drippings.
6. Never use water to extinguish a gasoline fire. Always use a chemical fire extinguisher or smother the fire with sand. Keep a supply of sand in the engine room and the storage room.
7. Use as little wood as possible for fittings in engine room. Where possible cover wooden posts, etc., with asbestos board.

To minimize the danger of explosions:

1. Have the engine room and the storeroom well ventilated.
2. Never let gasoline stand in open cans or tanks.
3. Do not pour gasoline from one container into another near open lights.
4. Do not spill gasoline.
5. Do not use gasoline for cleaning in a closed room.
6. Unless all the openings of empty cans or barrels are closed, always store them with the openings down so that the vapors may escape.

To minimize the danger from the exhaust gases of a gasoline engine:

1. Set the carburetor, or mixing valve, to give as lean a mixture as will run the engine.
2. Pipe the exhaust gases out of the engine room.
3. Do not work or even stand near the end of the exhaust pipe when the engine is running.
4. Do not try to purify the exhaust by turning it under water.
5. Unless the ventilation in the place where the engine is used is ample and positive, pipe the exhaust gases to some point where there is such ventilation, or pipe them to the surface.—*Technical Paper, No. 174, U. S. Bureau of Mines.*

Gun Division To Expand

WASHINGTON CORRESPONDENCE

An increase of personnel from three officers and seven civilians to 1500 officers and 10,000 civilians soon will have been shown by the Gun Division of the War Department's Bureau of Ordnance.

"The Gun Division," says a War Department memorandum, "has arranged for the production of many thousand cannon and the erection and complete equipment of 16 plants for their manufacture. These plants are well under way, and a number are practically complete. Forgings are already being produced, and the machining plants are in excellent state of progress. It was necessary to build these plants from the ground up, as no adequate facilities existed for this program, which covers practically all calibers of guns.

"The total program of the division calls for an expenditure of approximately $2,000,000,000. Orders for nearly all of the entire program have been placed."

The major projects of the Gun Division are summarized as follows:

Construction of smokeless powder plants in face of the necessity of doubling the present output. These are now under way.

Expenditure of approximately $40,000,000 for plant facilities to manufacture artillery cannon, with an estimate that $300,000,000 will be spent for cannon alone within two years after the outbreak of war.

Negotiations in many cities of the country for the erection of plants for the extraction of toluol from the illuminating gas being furnished these cities by private gas companies.

Conservation of the supply of ammonium nitrate and acids and construction at Government expense of a plant for the fixation of atmospheric nitrogen and its final conversion into ammonium nitrate.

Construction, now undertaken, of a gas filling plant to cost approximately $1,500,000, and the construction of five large shell filling plants, to cost in the aggregate $25,000,000.

Substitute for Tin Containers

An appeal was recently made by Food Administrator Hoover that a limit be set to the use of tin plate and tin foil in toilet articles and others where glass or paper cartons can be substituted for the tin containers. The *Journal* has been advised by S. H. Fellows, of Lockport, N. Y., that a company is now organizing with a practicable and proved solution of this problem. It will make a container of a substance the formula for which has been in process of perfection for the last eight years. The company is known as the Karamoid Manufacturing Co., and is about to break ground for a factory at Fort Madison, Iowa.

Editorials

Third Liberty Loan

"OVER THERE" are our boys fighting for us. They are fighting for the principles upon which this country must stand or fall. Over here we must do our part. We must build ships and munitions. We must put up the money that our Government needs.

In our advertising section we print 16 pages generously contributed by our advertisers and devoted to the Liberty Loan. We call the reader's attention to these pages. There is much for thought in them.

The Third Liberty Loan poster tells its story.—One, two, three! Now, all together! Let us make this loan a success! The concerted effort of 100,000,000 people cannot fail.

Whose War Is It?

THE most terrible misconception of this terrible time is the belief of some people that this is a rich man's war, a capitalistic war. The farming communities of Kansas are thoroughly permeated with the idea that vicious profiteering has made the farming class a burden-bearer, and they are brooding over this. The doctrinaires, simpletons and hoodlums echo this from their soap-boxes. The German propagandists cleverly foster it, for in so doing they know that they are accomplishing the German purpose better than by the winning of many battles. Consider what they have succeeded in doing in Russia and what they almost did in Italy.

Previous to the entrance of the United States into the war, business was extremely prosperous. Disturbance of this prosperity was the last thing that any business man wanted. Whenever there was any intimation that the United States might become involved in the war, as when the "Lusitania" was sunk, the stock market trembled. With the actual entry of the United States into the war there began a decline in the prices for securities that was deeply disturbing and distressing, On top of this, our industries were saddled with an appalling burden of taxation. "Is it not perfectly manifest to the meanest understanding," asks Mr. Kahn "that any business man fomenting our entrance into the war for the purpose of gain must have been entirely bereft of his senses and would have been a fit subject for the appointment of a guardian to take care of himself and his affairs?"

No, this is not a rich man's war as it is being fought by us. Germany may be fighting a rich man's war, but we are fighting for democracy, the very antithesis of what Germany is fighting for; and democracy means the interest of everybody. There is no such thing as class in this conception. Any American citizen who denies this, or broods over what he thinks is unfavorable class treatment, or seeks to arouse class animosities, repudiates the noble leadership of our President, than whom no statesman has enunciated more clearly the principles for which we are fighting. The lunatics of Russia and the poor fools who are deluded by them have fouled their own nest and have played the German game. The talkers in this country who would like to do likewise ought to be interned in places where they can do no harm. They should be treated as carriers of the germs of insidious disease, endangering the public.

While we have let these focuses of infection circulate without molestation, lest we be charged with interfering with the right of free speech, we have been too mealy-mouthed in talking to the workers who have listened to them. We have relied too much upon the sound admonitions of Samuel Gompers and William B. Wilson, whose exhortations have been most patriotic and praiseworthy, but, save when our President spoke angrily to the shipbuilders, no one of the great leaders has ventured to call a spade a spade. We have had too much cajoling, too much talk about a new order of things that is coming, too much about the prospective rule of the ditch-diggers, and there has been too much evasion of the incontestable fact that the root of most of the economic troubles of the time is that all the workers are not working as hard as they ought to. They have been allowed to listen to socialists, whose vocation is talking, not working, and they have not been taught adequately that this is above everything else *their* war.

Lloyd-George voiced this in his very outspoken speech to the Miners' Confederation on Mar. 21, when he declared that it would be far better that the government should go out of office than have its decisions disobeyed, saying:

> I have just had news that the Germans have attacked us on a front of nearly 60 miles with overwhelming forces. I am amazed that it should be considered debatable whether the miners and engineers are going to make their contribution to the defence of the country.
>
> If the sanction of the community is going to decide whether a law should be obeyed, then, believe me, you will have a condition of things where the people who will suffer most will not be the people at the top, who are generally able to take care of themselves, but the poor devils at the bottom. It has always been so in the history of the world.
>
> It is better to talk plainly, and I am speaking with a great deal of feeling because I have just heard of this overwhelming attack brought about by the failure of the Russian democracy to have its orders obeyed.
>
> If the attack succeeds, the Germans might be at Calais, and the only answer we can give is a vote of the Miners' Confederation saying they are not prepared to fight. You cannot give that answer.

Lenine and Trotzky played the German game by preaching "drop out of a capitalistic war," but as soon as the Germans took possession of Russian lands they told the laborers to get to work for the wages that they, the Germans, fixed; and they added that there would be no fooling about it.

Mineral and Metal Production

THE weather has a good deal to do with the yield of agricultural products, but not much with the products of mines. The latter are dependent mainly on the law of supply and demand. Let us therefore examine the subjoined statistics of the mineral industry in the United States in 1916 and 1917:

COMMODITIES PRODUCED FREELY

Item	Unit	1916	1917
Silver	(Troy oz.)	74,414,802	74,244,500
Aluminum	(pounds)	140,000,000	180,000,000
Ferromanganese	(long tons)	275.204	328,000
Spiegeleisen	(long tons)	187,233	187,000
Petroleum	(barrels)	300,767,158	341,800,000
Zinc	(short tons)	680,018	685,436
Lead	(short tons)	592,241	580,464
Cement	(barrels)	91,521,198	93,554,000
Quicksilver	(flasks)	29,932	36,351
Chromite	(long tons)	47,000	48,000
Arsenic	(short tons)	5,986	5,826
Salt	(short tons)	6,363,000	6,946,000
Magnesite	(short tons)	154,974	315,000
Lime	(short tons)	4,073,433	3,663,318
Graphite	(short tons)	5,466	6,800
Gold	(dollars)	92,590,300	84,456,600

PRICE-FIXED COMMODITIES

Item	Unit	1916	1917
Anthracite	(long tons)	67,376,364	77,133,305
Bituminous coal	(short tons)	502,519,682	544,142,000
Iron ore	(long tons)	75,167,672	75,324,000
Pig iron	(long tons)	39,032,792	38,185,982
Copper	(pounds)	1,942,776,309	1,888,395,945

In the above tables, the figures for zinc, lead and copper are our own; those for pig iron, ferromanganese, and spiegeleisen are from the *Iron Age;* the figures for aluminum are from the National City Bank; the others are as reported by the U. S. Geological Survey. We find a certain significance in the increased production of the unmolested commodities and the decreased in those whereof the price was fixed by the Government. Among the latter, coal is the only one exhibiting an increase, and in its case there is doubt as to whether the increase was really of carbon or of slate contained in the coal. It must be remarked that these figures, comparing the products of entire years, include a certain period of 1917 when all products were free and output was large. The statistics for iron and copper by quarters in 1917 show a decrease in the second half of the year as compared with the first half. The production of certain commodities during the whole year, for example zinc, decreased owing to overproduction in the early part of the year, but such was not the case with iron and copper, the supplies of which were steadily inadequate.

Gold and Platinum in the Adirondacks

WE UNDERSTAND that some new schemes for the mining of gold in the Adirondacks are being promoted, with the addition that platinum is now to be obtained, besides gold.

We have exposed this fallacy, and so has the Geological Survey of the State of New York, so many times, and with such emphasis, that there is scarcely anything to be said to the gullible but to repeat ourselves:

1. We do not believe that there are any commercial deposits of gold or platinum in the Adirondacks or adjacent regions.

2. Claims that there is any kind of gold or of platinum that is not revealed by standard methods of assaying and chemical analysis are silly.

New York and Philadelphia papers please copy.

Gompers Tells Workers They Must Speed Up

SAMUEL GOMPERS, president of the American Federation of Labor, issued a statement on Mar. 21 in which he called attention to the important part that labor must play in winning the war. The war must be fought out in the mines, farms, shops, mills and shipyards of the country as well as on the battlefields, he said, and the soldiers and sailors will be unable to win unless they are supported by the producers.

"This is a time," he went on, "when all workers must soberly face the grave importance of their daily work and decide industrial matters with a conscience mindful of the world relation of each fact.

"The worker is willing to sacrifice for an ideal, but not for the selfish gain of another. Consideration begets coöperation. These conditions are essential to war production. Production is necessary to win the war. Give workers a decent place to live, protect them against conditions that take all of their wages for a bare existence, give them agencies whereby their grievances can be adjusted and industrial justice assured, make it plain that their labor counts in the winning of a war of greater freedom, not for profiteering, and workers can be confidently expected to do their part.

"This is a laborer's war. It must be won by labor, and every stage in the fighting and the final victory must count for humanity. That result can only justify the awful sacrifice."

This is sound talk. Mr. Gompers states a platform upon which all workers, whether they be general managers or ditch-diggers, may stand. It is the platform of the square deal, of common interest, and of common sense.

Now listen to Henry B. Endicott, chairman of the Massachusetts Committee of Public Safety, himself a great employer of labor, in commenting on Charles M. Schwab's recent statement that labor will soon dominate industry:

"If Mr. Schwab meant by 'workmen' people who work and use their brains and muscles, I agree with him. If he meant what has been understood was his meaning, that the laboring man, so-called, would dominate the affairs of the world in the future, then I do not agree with him, nor do I believe for a moment that that is the intention and belief of the so-called labor element.

"What I believe is that there will have to be a full recognition, both on the part of the employer and the employee, as to their responsibilities. The employer should realize his responsibility toward his employees, meaning that he is responsible for the conditions under which they work, and, in order to be responsible for those conditions, he must enter into their daily lives, and study their ambitions and their desires, and share with them their sorrows and their success. If he will enter into their daily lives, and become a part of them, conditions under which he asks his employees to work will be such that differences between employer and employee will be very greatly eliminated.

"On the other hand, labor must recognize its responsibilities. It must realize that in a great measure it is up to the employees to make the business either a success or a failure.

"From my experience in dealing with labor it seems to me that workingmen have no desire as a class to dominate the Government. But, from their standpoint, they feel that all they honestly ask for is fair play and no favors."

This also is sound talk. It is just what Mr. Gompers has been saying. Employers and employees can stand together on this platform, just as Mr. Gompers and Mr. Endicott do.

Price-Fixing by Congress

IT WAS only a matter of time when Congress would take its hand in price-fixing, as in the last week it did in the matter of wheat. Congress has acted in such affairs as Dr. Cook's claim to the discovery of the North Pole, as Garabed's pretensions respecting perpetual motion, etc., so why not fix for wheat the price that the farmers would like to have, and for cotton what the cotton growers think proper, and so on?

We are bound to uphold the Administration in its opposition to any such legislation as is now pending in Congress. It would make confusion worse confused.

Richard H. Vail has retired from the editorial staff of the *Journal* after an association of 10 years, in order to enter Governmental service as a civilian employee of the Ordnance Department of the Army. Mr. Vail has occupied an important place on the *Journal*, having had charge of the executive work in getting out the paper, while as a technologist he devoted himself chiefly to metallurgical subjects. Previous to joining the staff he had been an efficient smelterman, and with us he became an accomplished editor. We feel a keen regret in the departure of this old colleague, but we cannot fail to applaud his spirit in going whither he felt that duty called.

Hearings on the Mineral Control bill were begun on Mar. 26 by the House Committee on Mines and Mining. All interests concerned were invited to be present.

BY THE WAY

A Bingham school teacher decided to teach her class of young pupils "America," to be sung on Flag Day. The class progressed favorably until they reached the line "I love thy rocks and rills," which they insisted upon singing, "I love thy rocks and drills." To them a rill was something unknown, a drill a reality, and the teacher had great difficulty in inducing them to sing the line properly.

The stock market is the most unprejudiced observer in the world, says the *Evening Post*. It is myriad minded and cosmopolitan. It reflects the combined knowledge and opinion of a huge number of men. It does not give an opinion for its mere effect on somebody else's morale. It does not try to reassure. It does not instill pessimism in order to "wake the country up." The last thing it wants is to deceive itself. The men in the stock market are risking money on their opinions; the statesmen and the newspaper editors are not. But the failing of the stock market is that, though it says Yes or No, one is not always sure what it is talking about.

Nuoline, the substitute for gasoline, "invented" by Dr. Louis Clement and that will cost from 2.5 to 8c. per gal., was given a try-out in New York on Mar. 19 in the presence of the Assistant District Attorney and Prof. Gies, of Columbia University. Dr. Clement manufactured his nuoline on the spot in about three hours, it is said, from the following ingredients: Naphtha flakes, benzine, saccharine, sodium bicarbonate, potassium chromate, alum, wood alcohol, oil of cedar, sulphuric acid, talcum powder and kerosene oil.

Nuoline thus made actually ran a Ford and a larger touring car, though it failed to move a two-ton truck. However, a statement was made by various expert chemists that nuoline would cost much more than 8c. per gal.; also that Dr. Clement appeared to lack scientific or technical knowledge of the subject. This statement was signed by Prof. Charles S. Baskerville, Gustave W. Thompson, chief chemist of the National Lead Co. and president of the American Institute of Chemical Engineers; Francis P. Smith, of Dow & Smith; Professor Gies, Dr. Charles F. McKenna, and John C. Olsen. The District Attorney figured in the case because Dr. Clement is charged with obtaining money under false pretenses.

Keeping Down the Costs

"You've got the right idea, young man,
  You're workin' 'ard to keep
Your costs down low," said Cap'n Dan—
  "You're operatin' cheap;
But you will learn a thing or two
And find this 'ere is mighty true:
  Your cheapest ore may cost the most;
  So wait a bit before you boast.

"Bill Tonkin, at the Adeline,
  Once said 'e didn't need
A powder man in all the mine;
  A fine, soft job, indeed!
'Just 'elp yourselves to dynamite.'
They did—two dead the second night.
  'E thought, as men 'ave thought before,
  To cut the costs of minin' ore.

"Another time 'e said, 'I fear
  My costs are now immense;
That change 'ouse won't be touched this year:
  Too bloody much expense.'
'E let 'em use the rotten dry
And watched the men get sick and die.
  This, you'll take 'eed, was one way more
  To cut the costs of minin' ore.

"And Tom Trezise, another one,
  Said timber was so 'igh,
'Ed cut the laggin' down, m' son,
  And some'ow they'd get by.
Worked fine until the mornin' when
They had to dig out fifteen men;
  One way, as I 'ave said before
  To cut the costs of minin' ore."

CHARLES NICHOLLS WEBB.

Personal

Have you contributed to the Association of the 27th Engineers?

C. M. Weld has returned to New York from Cuba.

Donald M. Palmer has entered the employ of the Chino Copper Company.

Fletcher G. Downs is manager of the Southern Graphite Co., at Ashland, Alabama.

Pierre Jourdain, a French mining engineer, has been visiting the Michigan copper country.

A. G. Wolf has been appointed superintendent of the Mary Murphy mine at Romley, Colorado.

E. L. Dufourcq has left for Mexico on professional work, to be absent until late in the Spring.

C. J. Garvin, of Denver, Colo., has been visiting Porcupine and other Northern Ontario mining camps.

R. Wilson Schultz has been appointed captain in the engineering bureau of the Ordnance Department.

James F. Callahan has taken over the management of the Sherman Mining Co., Shoshone County, Idaho.

H. Foster Bain is returning from China to accept the assistant directorship of the U. S. Bureau of Mines, under Van H. Manning.

H. P. Bope, vice president and general sales manager of the Carnegie Steel Co., has been reëlected president of the Pittsburg Radium Co.

D. C. Bard, consulting engineer of the Ladysmith Copper Corporation, examined mining property recently on Quadra Island, of the Valdes group.

Frederick W. Foote, mining engineer with G. W. Tower, Jr., has entered the Naval Reserve as ensign and is stationed at Washington, D. C.

William Wallace Mein, of New York, has been appointed by Secretary of Agriculture Houston as his representative regarding the fertilizer business.

L. W. Ledyard, recently manager of the Teck Hughes mine, Kirkland Lake, has been appointed general manager of the Kirkland-Porphyry property.

Judge Elbert H. Gary, chairman of the United States Steel Corporation, has been decorated with the Second Order of the Sacred Treasure by the Emperor of Japan.

J. M. Goetchius, vice president and director of General Chemical Co., has resigned in order to give his services to the Government. **A. W. Hawkes** has been elected to succeed him.

W. T. Eberhardt, manager of the Peabody Consolidated Copper Co., Cochise County, Ariz., for the last three years, has left Arizona and taken charge of the Compañia Oriental de Minas, in Cuba.

Landers Sevier has been elected vice president of the Sloss Sheffield Steel and Iron Co. **Waddill Catchings,** who recently resigned as president, was elected chairman of the board to succeed **J. C. Maben.**

Bulkeley Wells, vice president and general manager of the Smuggler Union Mining Co., Telluride, Colo., was in the Joplin district recently looking over the Anna Beaver mine, near Picher, Oklahoma.

W. H. Wright, of the Malm Wolf Co., has been commissioned captain in the Engineer Officers' Reserve Corps, and, while awaiting call to active service, is investigating copper properties in southwestern Colorado.

H. O. Hammond, for some time chief chemist for the Phelps Dodge Corporation at Douglas, Ariz., has resigned to become associated with the United Verde Extension Mining Co. in a similar capacity. His address will be Verde, Arizona.

Richard H. Vail has left the editorial staff of the "Engineering and Mining Journal" to go to Washington, where he is now engaged in work for the Ordnance Department. Mr. Vail was with the "Journal" about ten years, part of which time he was assistant editor. At the time of leaving he was performing the duties of managing editor.

Allen Murray Yonge has returned to the United States from Costa Rica and is in Philadelphia, where he has connected with E. E. Marshall, president of the American Manganese Manufacturing Co. While en route from San Jose to Puerto Limon, on his journey home, the passenger coach, in which Mr. Yonge was riding with his wife and daughter, was fired upon by revolutionary soldiers under General Gomez. Five passengers were killed and seven wounded. Mr. Yonge and his family escaped unharmed.

Obituary

Frank L. Underwood, formerly president of the British Columbia Copper Co., died on Mar. 17 in New York, aged 73 years.

Elisha J. Steele, who retired in 1916 from his position as vice president of the American Brass Co., died on Mar. 10 at his home in Torrington, Conn., at the age of 75.

Isaac Stephenson, former United States Senator, who died at his home, Marinette, Wis., Mar. 16, aged 88 years, had a considerable investment in mining and blast-furnace properties. The Stephenson mine at Gwinn, Mich., on one of his properties, is now being operated by the Cleveland-Cliffs Iron Co., Cleveland. Mr. Stevenson was a large stockholder in the Stephenson Charcoal Iron Co., Marquette, Mich., with stack at Wells, Mich., which he organized in 1911. Grant T. Stephenson, a son and the only surviving child, now a lieutenant in the Navy, is vice president of the Stephenson Charcoal Iron Co.

Societies

Engineers' Club of Northern Minnesota held its monthly meeting on Mar. 16 at Chisholm, Minn. Coöperation was the keynote of the occasion.

State Geologists will meet in Washington Apr. 3 to confer with the United States Geological Survey and Bureau of Mines with the hope of establishing even closer coöperation in work on war minerals.

American Society of Civil Engineers met on Mar. 20 in the Engineering Societies Bldg., New York. A paper by W. C. Hammatt, entitled "Determination of the Duty of Water by Analytical Experiment," was presented.

Geological Society of London held its annual meeting on Feb. 15 in London. The chief event of the occasion was the presentation of the Murchison medal to J. B. Tyrrell, of Toronto, in "recognition of the value of his many services to geological science." In Mr. Tyrrell's absence, Sir George Perley, High Commissioner for Canada, received the medal for him from the society's president.

Society of Chemical Industry, New York section, met on Mar. 14 in Rumford Hall, 50 East 41st St., New York. The program of the evening included "Resolutions on the Death of Thomas Tyrer." Mr. Tyrer was honorary treasurer of the society for many years. Cornelius F. Roland, of the National Tube Co., Pittsburgh, Penn., presented a paper on the "Manufacture of Welded and Seamless Tubing," which was illustrated with moving pictures. The usual informal dinner preceded the meeting.

Mining and Metallurgical Society of America will hold a special meeting on Apr. 18, at 8 p.m. at the Columbia University Club, 4 West 43rd St., New York. The meeting has been called for final action on amendments to the constitution and by-laws, copy of which was printed in bulletin No. 115 and mailed to all members, and for the purpose of discussing the proposed bill on the creation of an Administration of Minerals. The president has further requested the chairmen of the local sections to call section meetings for discussion of the bill. The meeting will be preceded by an informal dinner, as usual.

American Electrochemical Society Plans for the spring meeting are about completed, and provide for a tour through Tennessee and Alabama, with stops at the important electrochemical centers and water-power developments situated in these two states. Among the towns to be visited are Johnson City, Kingsport, Knoxville, Sheffield, Muscle Shoals, Chattanooga, Anniston, and Birmingham. A special train will be provided. About 100 members and guests have already signified their intention to participate. The meeting is scheduled for the week of Apr. 28, 1918. All those interested can obtain further details from Charles F. Roth, chairman of the committee, 50 East 41st St., New York.

New Patents

United States patent specifications listed below may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

Alkali Metals, Process and Apparatus for producing. Johannes Brode, Ludwigshafen-on-the-Rhine, Germany, assignor to Badische Anilin and Soda Fabrik, Ludwigshafen-on-the-Rhine, Germany. (U. S. No. 1,258,529; Mar. 5, 1918.)

Alloy, High-speed Cutting Tool. George L. Kelley, Germantown, and Albert H. Miller, Ambler, Penn., assignors to the Midvale Steel Co., Philadelphia, Penn. (U. S. No. 1,258,227; Mar. 5, 1918.)

Aluminum, Aluminous Composition and Method of Preparing the Same. Otis Hutchins, Niagara Falls, N. Y., assignor to the Carborundum Co., Niagara Falls, N. Y. (U. S. No. 1,257,356; Mar. 5, 1918.)

Aluminum, Production of. Georg Giulini, Lazzago, near Como, Italy. (U. S. No. 1,257,995; Mar. 5, 1918.)

Assay-Balance. Joseph H. Jacobs, Denver, Colo. (U. S. No. 1,258,009; Mar. 5, 1918.)

Compressing Air or Gases, Method of. Herbert Alfred Humphrey, Westminster, London, England, assignor to Humphrey Gas Pump Co. (U. S. 1,257,607; Mar. 5, 1918.)

Drag Scraper and Excavator. Arthur A. Charbondaux, Spokane, Wash. (U. S. No. 1,258,090; Mar. 5, 1918.)

Flotation Separation of Mixed Sulphide Ores. Charles Faul, St. Kilda, and Henry Lavers, Surrey Hills, Victoria, Australia, assignors, by Mesne assignments, to Minerals Separation North American Corporation. (U. S. No. 1,257,990. Mar. 5, 1918.)

Furnace, Electric. Henry Arnold Greaves and Harry Etchells, Sheffield, England. (U. S. No. 1,257,997; Mar. 5, 1918.)

Furnace Tilting. Harold Jennings Kitchen, Luton, England. (U. S. No. 1,257,879; Mar. 5, 1918.)

Ingot Mold. Emil Gathmann, Baltimore, Md. (U. S. No. 1,258,209; Mar. 5, 1918.)

Magnesium, Production of, by Electrolysis. George O. Seward, Jersey City, N. J., assignor to American Magnesium Corp. (U. S. No. 1,258,261; Mar. 5, 1918.)

Phosphate, Process of Making a Mixed Phosphatic and Nitrogenous Fertilizer. Robert F. Gardiner, Clarendon, Va. (U. S. No. 1,258,106; Mar. 5, 1918.)

Steam-Shovel and the Like. Clarence B. Weston, Marion, Ohio, assignor to Ball Engine Co., Erie, Penn. (U. S. No. 1,258,285; Mar. 5, 1918.)

Steam Shovels, Dipper for. William F. McMonegal, Hazleton, Penn. (U. S. No. 1,258,585; Mar. 5, 1918.)

Industrial News

Driver-Harris Co., Harrison, N. J., have recently issued an extensive bulletin on the subject of pure sheet nickel. Another bulletin on "Nichrome" wire mesh containers, for heat treating and acid cleaning, is in the hands of the printers, and will be ready for distribution within the course of a few days.

C. J. Wolfe has resigned as manager of the New York office of the United Smelting and Aluminum Co., New Haven, Conn. Benjamin S. Rosenberg, for a number of years connected with Eagle Smelting and Refining Works, Nassau Smelting and Refining Works, and Post van der Burg Co., has been appointed to succeed Mr. Wolfe.

Trade Catalogs

Gyratory Crushers, Elevators, Revolving Screens, Hoists, Complete Crushing Plants, etc. Traylor Engineering and Manufacturing Co., Allentown, Penn. Bulletin G-4. Pp. 34; 6¾ x 9½ in. Illustrated.

Editorial Correspondence

SAN FRANCISCO—Mar. 21

Six New Oil Wells Reported to the State Mining Bureau during the week ended Mar. 2. This brings the total number of new wells reported for the first two months of 1918 to 134. In the week, 16 wells were reported for test of water shut-off, 16 for deepening or redrilling and five for abandonment.

Northern California Power Co., Consolidated, on Feb. 27, reëlected W. F. Detert president, A. S. Carman vice president, and F. Reese, Jr., second vice president. The former secretary and general agent, Edward Whaley, was elected general manager, and W. H. Pearce, assistant secretary, was promoted to secretary. J. M. Rogers was made assistant secretary.

General Petroleum of the 6% first mortgage issue will be redeemed June 1, 1918, according to an announcement by Blythe and Witter, fiscal agents for the company. The outstanding issue amounts to $900,000. The original authorized issue was $1,400,000. Soon after beginning operations, the company retired $500,000. Eliminating the $900,000 bonds called for payment, there is at present a total funded debt, including both pipe line bonds and secured notes outstanding in the hands of the public, of $4,901,000.

Oregon, California and Eastern Ry., which operates north of Klamath Falls, Oregon, may be taken over by the Federal Government for the purpose of developing new potash fields at Silver Lake and to provide transportation facilities for new wheat country. This statement is reported to have been given out at San Francisco by Robert E. Straharn, of Seattle, president of the railroad. The railroad project was originally intended to connect three railway systems at Bend, Crane and Medford. About seven miles of right of way have been secured, but only 20 miles of actual operating track has been developed. This condition is said to be due to the recent prohibitive cost of railway material and the high cost of labor. The potash development and wheat transportation are the inducements that will probaly result in construction and operation under contro! of the Federal Government.

A System of National Defense Highways along the Pacific Coast is the subject of a recent pamphlet issued by Wisner Gillette Scott, mining engineer of Bishop, California, and secretary of the Inyo Good Road Club, which has been merged into the California National Defense Highway Association. The system as shown by the maps included in the pamphlet contemplates three trunk lines extending from the California-Mexico border to the British Columbia line. One line starts at San Diego, going north to Los Angeles, and there branches into the Coast trunk line and El Camino Sierra. The third line starts at Calexico, running north and crossing the eastern trunk line, and extends through the center of California and into Oregon and Washington. The El Camino Sierra also extends into Oregon and Washington, following the Sierra Nevada mountains in California and the Cascade mountains in Oregon and Washington. This system has been embodied in H. R. 9053, introduced in the Congress by John E. Raker, of California.

Federal Law Regulating Explosives will be enforced in California by the aid of a state advisory committee, which was organized in the offices of the Industrial Accident Commission on Feb. 26, 1918. The committee is composed as follows: John M. Griffin, U. S. explosive inspector for California, chairman; John A. O'Connel, of the State Council of Defense, vice chairman; William J. French, of the National Safety Council, secretary and publicity agent. The other members are Jay W. Stevens, National Board of Fire Underwriters; H. M. Wolfin, chief mine inspector of California; Robert I. Kerr, secretary California Metal Producers' Association; H. D. Gaskill, Hercules Powder Co.; William J. Gardener, Ocean Accident and Guarantee Corporation; Edwin Higgins, safety and efficiency manager, California Metal Producers' Association, and Chief of Police D. A. White, of San Francisco. David D. Bush, representative of U. S. Bureau of Mines, described the methods of organization followed in other states and urged the best coöperation of California organizations to assist the Federal Government to completely control the sale and use of explosives. The following were appointed as an executive committee; John M. Griffin, H. M. Wolfin, H. D. Gaskill, William J. Gardener, Jay W. Stevens. The powers of the Department of Justice and the Bureau of Mines were pledged to the support of the committee. Meetings will be held on the second and fourth Tuesdays of each month.

The State Railroad Commission has been requested by Mark L. Requa, director of the oil division of the National Fuel Administration, to postpone the hearing of the case of J. W. Jameson against the Producers' Transportation Co. What the purpose of the postponement may be has not been made public. The action was brought to compel the transportation company to handle the product of the independent operators, who at present pay 45c. per bbl. to get their oil to the refineries at Los Angeles by rail. The Producers' Transportation Co. owns and operates a pipe line from the Kern fields to Los Angeles and also to San Francisco. There are several pipe lines between the fields and these ports, and they are all owned by the large oil corporations. The independent producers insist that they are being shut out from delivery of their oil to the refineries. The Legislature five years ago provided that pipe lines are common carriers, but the pipe lines still decline to take oil for transportation. It is claimed that they are buyers of oil and the oil they buy is carried through their own pipe lines, so that the producer gets his oil to the market. Whether the market is at the refinery or in the field may be just the point that the independent operator is quarreling with the transportation companies about. It may be said for the large oil companies which are engaged in production, transportation, refining of oil and are also purchasers in the field, that their pipe line systems may not be equal to their requirements and all of the demands that might be made upon them by independent producers. It may also be said, on the other hand, that the independent producer could secure a more profitable market at the refineries than in the field, if transportation were available. It is not likely that Mr. Requa has any intention of interfering with the independent oil operator. But the promotion of the best interests of oil industry as a whole is of great importance just now.

Report of Golden Center Mine, at Grass Valley, has just been issued by Superintendent C. A. Brockington, covering several years of recent operation. The ore now being mined it is stated will not pay the expense of operation and necessary development at this time, so it will be necessary to increase the development fund in order to put the property on a paying basis. The report shows that below the No. 3 level the old orebody of the original working was exhausted, and no payable ore has since been shown on either side of the shaft, except a small shoot between No. 5 and No. 7. Between No. 9 and No. 11 a small lens of ore was encountered, but was not extensive. A flow of water encountered at No. 9 level required a complete change of the pumping system. The ore averaged only $5.80 per ton, which was not sufficient to cover cost of mining, milling and pumping. Water was again encountered in No. 11 level; three pumps were set, lifting about 400 gal. per min. This flow of water was draining found to be the Massachusetts Hill tunnel. In north drifts of No. 5 level high-grade ore running as high as $40 per ton was disclosed, but there was only a small amount in it. There is a body of ore in No. 8 level that runs about $8 per ton. The cost of labor, including mining, milling, pumping, and service expense, the report states is $4.21 per ton. Materials, power and other costs increase this amount to more than $8 per ton. The shaft is down 1860 ft. and the report suggests that if money cannot be secured to deepen the shaft the drifts should be extended. The single orebody that has been worked will not pay for the development of the mine. Golden Center mine was in the early days of mining in Grass Valley district one of the large producers of the country. It was reopened about five years ago by Mr. Brockington and associates and for a time prospects were fairly good for bringing the old mine back into the productive class. A good deal of attention was attracted to the venture at the time of its reopening on account of the situation of the property within the town limits and near the center of the town. Residences, stores and shops have grown up all around. But the unique situation of mining property does not make a mine. In addition to the requisite orebodies good management is essential.

SALT LAKE CITY—Mar. 22

Mine Safety Rules are being prepared for the State Industrial Commission by R. W. Watson, recently appointed inspector of metal mines. These rules may be used as a tentative draft, and they will be considered by a committee consisting of members of the American Mining Congress and of all of the mining interests affected.

Semi-Monthly Paydays at Bingham Mines are to be made the custom, following the example of the Utah Copper Co., instead of the former 30-day periods, as heretofore. The change will go into effect not later than the first of April. It is planned to discontinue all assignments of wages, as this practice entails considerable extra work for the mining companies, and will not be necessary under the new arrangement.

Mines Dumps Are Assessable by the state board of equalization, instead of by the county assessors, according to an interpretation placed on the law by D. B. Shields, Attorney General. In a letter to the state board of equalization, the Attorney General quotes the decision of the state supreme court in the case of the Mammoth Mining Co. against the commissioners of Juab County as the basis for his opinion. In valuation, the proceeds from the dumps, mills, and other apparatus for treatment are assessable, and not the dumps themselves. It is probable that this opinion will bring about a refund to the Utah Copper Co. by Salt Lake County in the matter of taxes paid by the company in 1917 on its tailings. The tailings ponds were at first assessed at $17,000,000 last year, and later at $6,000,000, on which latter valuation the company, under protest, paid taxes.

BUTTE, MONT.—Mar. 21

The Oil Industry in Montana, although promising to assume considerable importance within the next 10 years, is hampered in the development of legitimate enterprises at present by the activity of a large army of fakers that have entered the field and whose presence has given a black eye to legitimate operations. So numerous have these fakers become in Montana, and so bold their activity, that State Auditor Poland, whose duty it is to license agents who sell stock certificates, has issued a warning to the investing public against these oil-stock peddlers and has already brought several of them to account. It is hoped that he will succeed in eliminating this illicit business altogether, and thereby remove the cloud of mistrust that it has thrown over the oil industry of Montana.

The Tuolumne Mining Co. has held its annual meeting, and directors were elected for 1918. W. P. John, of Milwaukee, was elected a director and afterward appointed to the position of first vice president. The other directors are local men. The report of Manager Paul A. Gow showed that there was shipped to the Washoe smeltery from the Tuolumne mine in 1918 30,972 wet tons of ore, or an average of 2581 tons per month. The average grade was 2.431% copper, 1.471 oz. of silver and 0.0072 oz. gold per ton. This ore came from the 1200, 1400 and 2600 ft. levels. The Butte Main Range produced 10,967 wet tons of ore, averaging 1.972% copper, 9.422 oz. of silver and 0.0078 oz. of gold per ton. The new smeltery returns from the Tuolumne mine in 1918 were $200,302.95. and from the Main Range mine $106,702.50. The Tuolumne company will take over the Butte Main Range at a special meeting of the company to be held Mar. 30, as a great majority of the stockholders have already sent in their proxies to be voted as favorable to the sale on a pre-agreed basis.

The Metal Mine Workers Union, which is affiliated with the I. W. W., started agitation among the miners for an increase in wages. The demand is for $6 per day for six hours work, and it is also stated that there is a demand for the abolition of the rustling card system. A meeting was held Sunday afternoon and about 300 were present. The same agitators who caused the shut-down last summer were among the speakers. How far these men will be able to carry on their work without bringing themselves within the reach of the sedition act passed recently at the special session of the Legislature it is hard to say. It is no secret that many I. W. W. are coming into the city from outside parts, and they are well supplied with money. There is a belief here that they will move among the miners and agitate for a walk-out, believing that they will be able to carry out this scheme, being unknown to the authorities. The plan is to make a move of some kind Apr. 1.

WALLACE, IDAHO—Mar. 22

The Federal Mining and Smelting Co. has adopted a practical and effective plan to induce the purchase of thrift and war-savings stamps by its employees. To each employee along with his pay check is handed a printed slip the same size as the check, upon which is an urgent appeal to him to buy thrift and war-savings stamps. The plan is a good one, for it appeals to the employee at the most opportune time—when he has money—and it is believed that it will result in a large increase in thrift-stamp sales.

The Success Mining Co. Ltd.'s new management, which took over control last November, after a long and bitter fight, has issued an interesting report. For more than a year the company had been operating at a loss, which in 1917 amounted to $122,879. The new management at once began cutting expenses, both by reducing salaries and reducing the force employed at the mine and mill. Development and prospecting by diamond drill were also undertaken. Milling was reduced to one shift. The report, while not pretending to cover all details, shows that in January and February the company actually made a net profit of $23,914. Eighty men are on the payroll, and the mill is treating 97 tons per day. The mill feed averages 14% zinc, 4% lead and 3 oz. of silver per ton. A new oreshoot found on the 1500 level has been explored for a length of 80 ft. with steady improvement, and ore coming in on the 1600 is believed to be of the same shoot. In closing, the report states as follows: **"The outlook** for the future of the property by reason of the ore disclosures on the 1500 and 1600 levels (which are entirely new orebodies) is more attractive than at any time since the new management took charge, the ore on the 1500 level being longer and of better grade than any oreshoot mined heretofore from the 1200 level downward."

The Bill Protecting Soldiers' Assessments, in the opinion of Hon. Addison T. Smith, Congressman from Idaho, which has just passed Congress, "to extend protection to the civil rights of members of the military and naval establishments of the United States engaged in the present war," will afford protection "to soldiers and sailors who own assessable stock without any additional modification." This opinion was given in reply to a request to offer an amendment which would prevent the sale of such stock for failure to pay assessments. Probably 75% of the men who have gone to the war from the Cœur d'Alene district own shares in mining companies which are financed by assessing the stock, and the absence of any specific law protecting their holdings has caused them much anxiety. Many companies are voluntarily carrying stock held by men in the service when they are known, but the stock of most companies is widely scattered, and it is impossible for company officers to know all who are in war service. Under the provision of the law, which Mr. Smith says applies to shares in stock companies, if stock belonging to a soldier or sailor should be sold for assessment since the passage of the law, the owner can recover from the company. If men in the service holding such stock would notify the secretaries of the companies, it would simplify the matter and forestall possible trouble.

The Caledonia Mining Co. has issued a statement covering its operations in 1917, in which the most striking feature was the low operating expense as compared with the large profits. On Dec. 31 the company had a cash surplus of $730,962, of which $427,345 was cash in banks, $175,000 in Liberty bonds, and $124,568 due from smelteries. During the year the company produced 17,982 dry tons, which yielded 9,434,900 lb. of lead, for which the company received $826,297; 1,068,699 oz. of silver, $873,036; and 544,801 lb. of copper, $149,920. Gross value was $1,849,254, which, with smeltery deductions, $484,988, leaves the net value of the product $1,364,266. The average price received for lead was 0.875c. per lb., and the average lead content 26.23%; silver, 0.817c. per oz., averaging 59.43 oz. per ton; copper 0.2754c. per lb. and averaging 1.51%. The total mining, milling and shipping costs amounted to only $137,110, divided as follows: Mining 38,557 tons at $2.95 per ton, $113,653; milling 27.122 tons at $0.72 per ton, $19,451; shipping 19,625 tons at $0.20 per ton, $4006. Net profit for the year, $1,227,155. Dividends paid during the year, $937,800. Total dividends paid to date, $2,901,606. Net profit during the last quarter, $212,322. The company is paying dividends at the rate of 3c. per share per month, or $78,150. This is considerably in excess of the present earnings. In a brief statement accompanying the report, Manager Charles McKinnis says: "During the year many hundreds of feet of development work have been done trying to find new ore or the downward extension of the old orebodies. In this we were unsuccessful. The amount of war tax we will have to pay is unknown, but it will be a large sum. We intend to continue the present dividend rate as long as it is policy to do so. Just how soon this rate will have to be discontinued, your directors are unable to say."

HOUGHTON, MICH.—Mar. 21

The Mass Consolidated Report for 1917 shows that better than 30% of the output was mass or barrel copper. Of this a large percentage went directly to the Quincy smeltery. The production of copper amounted to 4,000,000 lb., slightly less than in 1916. The cost, exclusive of construction, was 19c. per lb. Mass Consolidated's costs cannot be maintained under 22c. per lb. in 1918 except by some unforeseen economy. In 1917, $80,000 was spent in construction, mostly for employees' houses. Additional construction planned is a new rockhouse for B shaft, and the lumber is now on the ground. The new rockhouse will be considerably larger than the one now in use. It will be built to the rear of the present structure, and there need be no suspension of operations at the mine during construction. Delays due to rockhouse breakages will be diminished. These were due primarily to the unusual amount of mass copper. While this copper is rich, it is a great trouble maker in the rockhouse crusher. No other mine in the district, excepting possibly the Victoria, gets as large a percentage of native copper as the Mass mine.

JOPLIN, MO.—Mar. 22

Kanoak Metals Co. recently placed two new mills in operation as the first step toward expansion in this field. The company has three other mill sites where plants are likely to be erected in the near future. One of the completed mills is in the south part of Picher, near the St. Joe mine, and is known as the Premier. It has a capacity of 450-ton per shift and is electrically equipped. Ore is being hoisted from the 190- and 122-ft. levels. The first day's operation recovered 35,000 lb. galena and sphalerite. The other mill completed is the Chicago, southeast of Douthat, Okla. The first two weeks' operations at this mill resulted in a production of 289,000 lb. of high-grade zinc-blende. The average yield in concentrates made from the ore hoisted was better than 10%. Operations were at the 148 ft. level. The Kanoak Metals Co. also has a promising lease two miles west of Badger, Kan., northeast of Baxter Springs, known as McBee mine, where the shaft is in ore and a mill is planned for early erection. The company also has four good drill holes on the Ellis land, north of Blue Mound about one mile, and contemplate mill construction there during summer. A. M. Gaines, of Joplin, formerly superintendent of the Chicago mine at Klondike, is manager of properties.

Zinc Ore Producers Are Becoming Perturbed over conditions. Ore prices have been steadily declining for some weeks, and during the last week were quoted at from $45 to $65, with the average settlement probably about $51 per ton. Only a small tonnage brings the top price. Notwithstanding, the new developments in the Oklahoma section of the field have resulted in a steadily increasing output. The sheet-ground mines are almost all down now. From Duenweg to Oronogo, including the Webb City-Carterville camps, there are now only about a dozen plants operating where there were 80 a year ago, although the output for the district is larger than ever. Oklahoma producers, however, are now seriously talking curtailment, and it is believed something of this character will take place soon. It is clear that, under existing conditions, $50 per ton now is a poorer return than $40 per ton before the war, and there was no money in zinc mining at the latter figure at that time. At a meeting of operators of the tri-state Safety and Sanitation Association recently, President O. F. Brinton, of Baxter, Kan., called the attention of operators to a brief prepared by W. R. Ingalls in the interest of zinc smelters, in which he expressed a belief a lower grade spelter might safely be used by the Government in the manufacture of war munitions, and some action upon this suggestion will be taken at this week's meeting. Temple Chapman, well known local operator, predicts that new development will amount soon to an increased production of at least 1000 tons per week, without any apparent increase in demand; and in a signed article says: "We cannot go on with business as usual, and it becomes both our patriotic duty and good business to call together our representative mining men and discuss our war-time problems with a view of making the best of war conditions."

TORONTO—Mar. 23

Labor Conditions in the Northern Ontario mining camps are becoming much more favorable. Some of the Cobalt mines have been largely reducing their working forces, and there has been a large influx of men from other parts of the province. Many have gone from Cobalt to Kirkland Lake and Porcupine, and operators of outlying properties some distance from the railroad are able to obtain plenty of labor.

Annual Report of the Trethewey shows a decrease of 2670 tons in ore reserves, as compared with 1916. Estimated amount of silver in ore reserves was 264,044 oz., compared with 361,482, being net decrease of 27%. During the year 34,722 tons of ore were milled, yielding 341,278 oz. Net value of ore produced was $263,016, with operating profit of $114,934, out of which a dividend of $50,000 was paid. President S. R. Wickett stated that it was intended to erect a plant for the treatment of tailings, of which there were estimated to be about 66,000 tons, showing an average of 4.7 oz. per ton. The cost of the plant was estimated at $20,000.

Owing to the Critical Situation as regards the supply of natural gas in Essex, Kent and Lambton Counties, Ont., which, combined with the coal shortage, has resulted in much suffering in Windsor and other places, the Ontario government has passed a remedial measure. A bill was introduced and rushed through three readings, placing the entire control of the production, transmission and consumption of the natural gas of the province in the hands of the Ontario Railway and Municipal Board. The board has issued an order reserving for domestic consumption all the gas from wells in Kent County and cutting off manufacturers and large commercial users.

The Canadian and Ontario Governments will coöperate in extensive experimental work during the coming season to determine the possibilities of peat as a fuel, which has been for some time receiving the attention of the Canadian Department of Mines. Their investigations have shown the existence of 140,000 acres of peat bogs favorably situated in regard to settled districts and transportation facilities, the contents of which are estimated approximately at 120,000,000 tons, containing 25% of moisture. The feasibility of producing from peat a usable domestic fuel having been demonstrated, the forthcoming experimental work will principally be directed to the problem of cheap handling, and improvements in the methods of excavation, spreading, harvesting and transportation.

The Canadian Government is taking active measures to place the railways in condition to handle traffic efficiently by extensive renewals of rails, which were unquestionably needed, and additions of rolling stock. An order has been placed with the Dominion Iron & Steel Co. of Sydney, N. S., for 100,000 tons of 80-lb. steel rails to be delivered by July 31. Some 500 miles of lighter rails manufactured in the United States for the Russian government have also been secured. The 80-lb. steel will be used for the main lines of traffic, and in addition to supplying the requirements of the government railways, now including the Canadian Northern, the rails will be furnished at cost, plus transportation, to the Canadian Pacific and Grand Trunk. The lighter rails will be put down on branch lines and sidings. It may in addition be necessary to remove some or all of the heavy steel from the Hudson Bay road, now in course of construction, and substitute light rails. The government will also purchase about 7500 cars and 150 locomotives to supply rolling stock deficiencies. Numerous tenders have been received, the prices set indicating a great increase of cost, and before accepting any of them inquiries are being made into the details entering into cost, to ascertain how far these increases are justified.

The Mining News

ARIZONA

Graham County

IRON CAP (Copper Hill)—Vein cut by shaft 1000 level 52 ft. wide and averages 4% copper.

Yavapai County

CONSOLIDATED ARIZONA (Humboldt)—Two orebodies in course of development on 1200 level opening out satisfactorily.

Greenlee County

ARIZONA COPPER CO. (Clifton)—Production of copper in February, 3,600,000 lb.

ARKANSAS

Boone County

BEN HARRISON (Zinc)—Operated by J. W. Baxter and associates. Have a carload of hand-cobbed lead ore ready for shipment.

McCURRY M. & M. Co. (Zinc)—Starting construction 100-ton concentrator at Houck mine. Machinery on ground for new 100-ton plant at Rhodes-Manchester. Both properties under control of McCurry Mining and Milling Co. W. A. McCurry is general manager.

Marion County

COWAN BARRENS DEEP (Yellville)—Have drill at work now prospecting for deep ore.

WILLETT (Yellville)—Forty-acre lease under operation by Liberty Lead and Zinc Co. Developed by tunnels. Body of carbonate jack; 150-ton concentrator put into operation last week.

DRY PROCESS MILL (Summit)—Mill completed to start up soon. Will do custom work. Will make separation of carbonate and blende ores and concentrates. T. E. Dollahon is general manager.

CALIFORNIA

Amador County

BUNKER HILL (Amador City) — Extensive development work planned.

SOUTH EUREKA (Sutter Creek)—Pumps still in active operation and mine to be kept clear of water.

CENTRAL EUREKA (Sutter Creek)—Sinking in progress. Conditions and indications on the 3350 and 3425 levels good.

ARGONAUT (Jackson)—Reported additional 150 ft. will be sunk in the shaft. Now 4785 ft. inclined depth or 4145 vertical. The additional depth to make possible extraction of large quantity of ore below the present bottom. The ore to be hoisted with 500-hp. electric hoist now on 3900 station. Is largest underground hoist on the Mother Lode. Mill in constant operation on good-grade ore from the 3600, 3700, 3900, 4000, and 4500 levels. Vein is said to be regular, averaging 8 to 12 ft. wide. N. S. Kelsey is manager.

Calaveras County

FOOT HILL COPPERS INC. (Angels Camp)—Lease on the Quail Hill mine. New mill and mining plant practically completed. Property to be actively operated.

Eldorado County

RED WING (El Dorado)—Reported rich strike made in 3-ft. vein. Mine being developed by tunnel.

Kern County

MID-STATE OIL CO. (Sacramento)—Company purposes to drill for oil and expects to begin work soon.

COLORADO

Clear Creek County

BONANZA (Idaho Springs)—Group to be worked by recently organized Denver company.

ARGENTINE & CREOLE (Georgetown)—Operated by local pool. Properties on Leavenworth Mountain.

TEDDY BEAR GROUP (Lawson)—Reopened under bond and lease. Ore contains high silver in gray copper.

Lake County

ROY GROUP (Leadville)—Ground on Canterbury Hill to be extensively developed by heirs of Thomas F. Walsh estate.

Mineral County

QUINTET (Creede)—Worked under lease by A. E. Collins. Large shoot high-grade silver ore opened, and lease now paying regular dividends.

San Juan County

SUNNYSIDE (Eureka)—New tramway completed and transporting supplies and material to mine. Tables and machinery being installed in 500-ton concentrator.

RED MOUNTAIN DISTRICT blockaded by snow, preventing production, but development work under way at Genessee-Vanderbilt, Yankee Girl, Koehler Tunnell, St. Paul and other mines. Fluorspar is hauled from Barstow mine to Ouray.

San Miguel County

SHIPMENTS FROM TELLURIDE in February were: Smuggler-Union, 49 cars; Black Bear, 42; Liberty Bell, 17; Tomboy, 52; Carruthers, 1; total, 141 cars, all concentrates. This is 19 cars more than in January, and 15 cars more than in February, 1917.

CARBONERO (Ophir)—Recent developments permitted the shipment of two cars of crude ore worth $50 a ton.

SILVER BELL (Ophir Loop)—High-grade gray copper ore and lead ore opened in an upper level of mine by B. W. Purdy and associates developing under lease.

CARRUTHERS (Telluride)—Lease on part of Smuggler-Union ground opening steadily and making regular shipments of bullion and concentrates.

CARBONERO (Ophir) — Upper levels operated by lessees. Lower tunnel stopes worked by company; machine drills used. Regular shipments of lead-silver ore.

LEWIS (Blue Lake)—Mill operating 24 hours per day on ore from development. Metallurgical results encouraging. Flotation results good. Roy Parker is mill superintendent.

TOMBOY (Savage Basin)—Fire recently destroyed the Cincinnati timber house, 54 by 70 ft., blacksmith shops, 34 by 36 ft., and machine shop, 10 by 16 ft. Loss estimated at $4000, but fully covered by insurance.

PRIMOS CHEMICAL CO. (Bear Creek)—Compressor plant buildings and a small cabin used as a residence burned to ground recently. The compressor building was 40 by 70 ft. and contained valuable machinery. The loss is estimated at $7000. The machine shop saved. Cause unknown.

BLACK BEAR (Pandora) — Producing 150 tons of ore daily for treatment at Smuggler-Union mills, and at the same time reserves being increased. A 200-ft. winze started from the lowest level and drifts will be driven both ways on the vein from bottom. One of the largest blocks in the mine now 100 ft. high, 1300 ft. long, and has average width of 6 ft.

Summit County

YUBA DREDGE (Breckenridge)—Operations temporarily stopped account burning out transformers second time.

MUTUAL CO-OPERATIVE MINING CO. (Kokomo)—High-grade silver ore being shipped. This ore opened in mining pyritic ore.

I. X. L. (Breckenridge)—Operated by Royal Tiger Mining Co. Winze below main tunnel level opened good-grade ore to depth 30 ft. Sinking under way.

LIBERTY LEASING CO. (Breckenridge)—Milling plant at Monte Cristo mine remodeled, and now ready for operation. Work to begin soon.

MID-WEST METAL MINING CO. (Breckenridge) — Operating Iron Mask mine under lease and option. Shipments good-grade lead carbonate ore from winze. Workings below main tunnel temporarily delayed by train blockade. Large shoot iron sulphide ore also opened. Shaft to be sunk to more fully develop property.

Teller County

WILD HORSE (Cripple Creek)—Wild Horse shaft section worked by leasing company. Ore good milling grade broken from shoot 75 to 100 ft. wide in places. Owned by United Gold Mines Co.

EL PASO CONSOLIDATED (Cripple Creek)—Entire dumps of Nichols and El Paso shafts to be shipped to Golden Cycle mill. Said to average $3 per ton.

CAROLINA (Cripple Creek)—Lessees Fink and Carson sunk shaft to 130 ft. on block 3, and developed oreshoot 100 ft. long on so-called "high" vein. Shipments being made.

FOREST QUEEN (Cripple Creek)—Oreshoots of smelting grade on 6th and 7th levels opened to lengths of 60 and 75 ft. Considerable ore assaying $15 per ton still being drawn from old stopes between 600 and 450 levels.

EL PASO EXTENSION (Cripple Creek)—Operating Index mine under lease and bond. Shipments to start upon completion railroad switch to loading bins. Drifting in ore under way from bottom of winze at 1050 level. On 200, 300 and 400 levels sublessees working in ore. In Pointer vein, ore containing gray copper and high silver opened—unusual in district.

IDAHO

Shoshone County

PINE CREEK DISTRICT railroad, which was washed out for nearly two miles late in 1917, has been partly restored. New contractors now on ground and road to be extended a mile above Beeler, over half the length of the proposed branch. Since washout mining has been suspended. Active summer campaign at mines expected. The Douglas mine, under lease to the Anaconda company, began shipping again last week, and shipments will soon follow from the Nabob (Stewart company), Constitution and Highland-Surprise.

SIDNEY (Beeler)—Property on Pine Creek taken under bond and lease for $150,000. Joins Stewart company. Considerable ore developed.

SHERMAN (Burke) — Formerly known as Union. Recently crosscut 18 ft. of ore already proved 140 ft. long. Six feet is shipping grade lead, balance of shoot good milling ore containing zinc. Stopes being opened. James F. Callahan is manager. Sherman joins Tamarack & Custer on east and has both Tamarack and Custer veins.

MICHIGAN

Copper

COPPER RANGE (Painesdale)—Bonus of 25c. additional for all employees daily beginning Feb. 1, payable semi-monthly.

HANCOCK (Hancock)—February production 320,000 lb. refined copper, as compared with 276,000 for January.

NEW ARCADIAN (Houghton)—Entered lode for eight ft. with good-grade ore on 1850-ft. level.

CENTENNIAL—All levels 29th to 37th inclusive out to northern boundary in good-grade ore; lowest drift on 38th; No. 2 shaft serving this territory down to 40th level.

FEDERAL SYNDICATE (Calumet)—First hole at Sec. 56-34, which was stopped by boulder at depth of 119 ft., has been reopened, boulder pushed out of way and down 145 ft.; progressing rapidly.

AHMEEK (Ahmeek) — Production to Mar. 16 5400 tons, new record. Drift from shaft No. 4, northernmost, on 15th level in 2100 ft. out of a distance to Seneca of 4000 averaging 19 lb. per ton.

CALUMET & HECLA (Calumet)—Daily tonnage about 10,500 from Calumet conglomerate and Osceola magydaloid lodes; is testing out machines for mechanical shoveling.

QUINCY (Hancock) — Daily tonnage 4500 to 4800 from three shafts, best for number of shafts in district; 30-ft. diameter drum of new Nordberg double-compound hoisting engine, good for 10,000 ft.

MAYFLOWER-OLD COLONY (Houghton)—Shaft on lode discovered 2½ years ago and tested by many holes on each property averaging high in grades, but broken and faulted, down 381 ft.; hoisting engine ready and skips put on; sinking

will be faster. Shaft in thick bed of trap rock so far.

HOUGHTON COPPER (Houghton)—About 30 ft. driven on own ground in 19th level drift from Superior mine; heavy timbering required; no copper. Object to explore lower territory, as winze from 12th level cannot be carried further and shaft only at 6th level.

VICTORIA (Victoria Mine)—February made record for yield, 16 lb. per ton, as compared with 15 lb. for last three months and 11 lb. previously. Concentrates and mass, 130 tons, as compared with 153 tons for January and 136 for December. Started to sink shaft from 27th level. Rich rock coming from 23rd, 24th, 25th, 26th, and 27th levels. Short of men and water low in Obtonagon river, using steam power for mill.

MISSOURI

Joplin District

ADAMS-HICKS (Joplin)—Started up after shutdown since heavy snow of Dec. 7.

LACLEDE (Picher, Okla.)—Added 200 hp. gas engine to equipment. Output recently less in lead content.

O. T. O. & G. (Lincolnville, Okla.)—Started up old Katy mine, operated recently by Royal Shell Co. M. A. Tracy, Baxter Springs, is manager.

BLUE BONNET (Hockerville, Okla.)—Started construction new mill south Hockerville. Part equipment from Porto Rico No. 2 mill recently purchased.

BILHARZ (Baxter, Kan.)—Started erection No. 5 mill north of Picher. Recently completed No. 4 mill on site of No. 1, lost by fire.

INDIAN CHIEF (Hockerville, Okla.)—Started shaft sinking preparatory to mill erection. Twelve drill holes in ore. E. W. Clark, Purcell, Okla., is president.

MONTANA

Lewis and Clark County

THOMAS CRUSE DEVELOPING CO. (Helena)—Ore shipments to smeltery coming out from above 640 level. Helena Mining Bureau shipping from 200-ft. shoot above 300 level.

SILVER MINE (Little Creek)—Cross lead discovered in drift from 250-ft. station; lead two ft. wide and assays well in silver. Over 1000 sacks of ore ready to ship.

Jefferson County

ECONOMY MINE (Mitchell Gulch)—Mine developed to 300 level ready for stoping and milling. New concentrator under construction.

FREE COINAGE MINE (Lump Gulch)—Vertical shaft nearly completed to 300 level. Shaft in country rock, but near lead, which will be recovered by crosscut at 300 station. Silver ore.

Silverbow County

BUTTE COPPER AND ZINC (Butte)—Announced that company, operating Emma mine in Butte, has closed contract for sale of 5000 tons of manganese ore, one half of it to go to Steel Corporation, other half to independent companies.

BUTTE & PLUTUS (Butte)—Started to sink shafts on Plutus claim, located north of the Anaconda Nettie mine. Silver and manganese ores said to occur. Property to be exploited on extensive scale. John R. Moyle is president.

NEVADA

Clark County

SULTAN (Goodsprings)—Dry concentrating plant recently overhauled and enlarged. Property now producing lead concentrates and crude zinc ore. Owned and operated by Henry Robbins.

RED STREAK (Goodsprings)—Producing high-grade copper ore. Plans under way for consolidation with adjoining Copper Side claims, and a long tunnel to develop the properties at depth is contemplated. Alex Anderson is manager.

BOSS (Goodsprings)—Producing copper-platinum ore, which is shipped to Los Angeles for treatment; also copper ore, which goes to Salt Lake smelteries. Considerable body of high-grade copper ore recently discovered on upper levels. H. K. Riddall is manager.

HOOSIER (Goodsprings)—Situated eight miles west of Goodsprings. Recently taken over by Los Angeles interests, headed by John Gutendorf, who is general manager. Air compressor installed and extensive development planned. Work begun on a 50-ton concentrator. Will use jigs and Wilfley tables to concentrate low-grade lead-silver ore. Considerable tonnage in mine and on dumps. Pumping plant being installed in valley below, and a pipe line constructed 4½ miles to mine.

MANGANESE ASSOCIATION (Las Vegas)—Situated 16 miles east of Las Vegas. Since first of year, property produced 300 tons of manganese ore, averaging 41% Mn, 11% SiO_2 and 0.03% phosphorus. Now producing 150 tons daily, and expected to increase to 300 tons. Ore hauled to Las Vegas by White motor trucks. Mining all by open-cut, ore in nearly horizontal bed 40 ft. thick. Core drills proving lateral extent and surface outcrops indicate a considerable area. Ore-bins and hoist are being installed. Recently incorporated. Officers are Dr. R. W. Martin, James McCoy, J. O. Gillice and W. H. Connors.

LOWNEY MANGANESE ASSOCIATION (Las Vegas)—Adjoining Manganese Association and operated by Goodsprings interests. A 60-ft. shaft developed a 6-ft. vein of manganese ore, averaging 40 to 45% Mn. Surface cuts proved lateral extent to be several hundred feet. Hoisting plant and ore bins to be erected in the near future, and shipments to begin before the end of March. J. M. Carter is superintendent. Other prospects in the vicinity have favorable showings and probably will be producing in the near future.

YELLOW PINE (Goodsprings)—Milling plant closed down since February, but property continues to produce as much ore as formerly. Bulk of the production is shipped to Pennsylvania as a mixed oxidized lead-zinc ore used for making oxide. Crude zinc and crude lead ores are sorted at mine and shipped separately. New crushing and sorting plant installed to facilitate this work. Making more profit by new practice than by former practice of milling, owing to low markets for zinc ores. Dividends of $60,000 were paid Mar. 2. Important developments at mine have disclosed a new orebody of large dimensions at the north extremity of workings.

Nye County

TONOPAH ORE PRODUCTION for week ended Mar. 9 was 8873 tons. Estimated gross milling value, $150,841. Producers: Tonopah Belmont, 2114 tons; Tonopah Mining, 2400; Tonopah Extension, 1993; Jim Butler, 457; West End, 1049; MacNamara, 614; Montana, 155; Cash Boy, 55; and miscellaneous 36 tons.

UNION AMALGAMATED (Manhattan)—Preparations for drifting being made east and west on 600 and orebody cut last year by Bath and Earl shafts connection. Mill expected to start up within 30 days.

WHITE CAPS MINING (Manhattan)—Limestone belt expected in 500 west drift, in 40 ft. Raise 506 up 30 ft. in ore. Hoisting mostly from 300 east orebody and 302 hanging-wall stope. Sill floor of 406 stope advancing west in mill-grade ore 50 ft. wide. Sill floor 506 stope advancing west 30 ft. wide. Mill treating 115 tons per day.

MANHATTAN CON. (Manhattan)—Flow in shaft, estimated at 75 gal. per min., developed recently after third round in black Morning Glory limestone. No. 6 Cameron submerged. Water rose 130 ft. or to 400 pumping station level in few hours. Now handling 120 gal. per min. No. 7 Knowles borrowed from White Caps and water lowered 70 ft. in three days. Flow but temporary.

UTAH

Beaver County

UTAH LEASING (Newhouse)—Report to board of equalization shows net proceeds of $52,791 during 1917 from Cactus dump. Total production from dump in gold, silver and copper, $439,155, and cost of extraction, $386,373.

Juab County

LEHI TINTIC (Eureka)—Shipment of two cars of ore expected when weather permits. Ore followed above and below main tunnel level.

SOUTH STANDARD (Eureka)—Owns 2000 acres in eastern end of Tintic district. To undertake development. E. J. Raddatz is interested.

TINTIC DELAWARE (Tintic Junction)—Stated sufficient ore developed to permit regular shipments in spring. Trucks to be used. Ore, lead-silver.

TINTIC DRAIN TUNNEL (Eureka)—Transformers ordered three months ago by Utah Power and Light Co. delayed, and holding back work on tunnel. Now in 300 feet.

TINTIC STANDARD (Eureka)—Draining road from mine to loading station on D. & R. G. R.R., and making general improvements. Extra truck—making four in all—added to eliminate hauling by teams. Shipments at present held down by bad roads.

DRAGON CONSOLIDATED (Silver City)—Winze down 700 ft. below 1000 level of old workings. Water flowing in, and work suspended. Expect to go several hundred feet further. Possible that work at this particular point will be left until Tintic drain tunnel reaches this section.

Piute County

MARYSVALE DISTRICT reports considerable activity in the potash district and additional finds of alunite.

UTAH FERTILIZER AND CHEMICAL (Marysvale)—Shipping up to 150 tons of alunite-bearing rock daily to reduction plant in New Jersey. Freight $13 per ton. Good profit reported.

FLORENCE MINING AND MILLING (Marysvale)—Treating 20 tons of alunite daily at plant near Marysvale station. Capacity shortly to be increased to 100 tons daily. M. F. Murray, manager.

Salt Lake County

CARDIFF (Salt Lake)—Chief producer of Big Cottonwood canyon reported to have found second orebody in deeper development.

GREAT SALT LAKE OIL AND GAS (Salt Lake)—Filed articles of incorporation; to do drilling near southern end of Great Salt Lake. J. S. Ebert is president.

UTAH MINERAL PAINT (Ogden)—Mine near Koosharen, in Sevier County, and manufacturing paint at plant in Salt Lake. Officers: J. A. Checketts, president; W. E. Raybould, P. A. Kohn, directors.

Tooele County

COPPEROPOLIS (Gold Hill)—Shipment of copper-silver ore made week ended Mar. 9. Lessees driving tunnel to follow mineralized vein.

WOODMAN MINING (Gold Hill)—Car of copper ore shipped from Frankie mine week ended Mar. 9. Work resumed on Log Cabin claim, where bismuth ore being opened.

GARRISON MONSTER (Gold Hill)—Lessees opened unusually rich gold ore by diamond drilling. Vein several feet wide producing some lead-silver ore of good grade. Bismuth also found.

ONTARIO

OTISEE (Fort Matachewan)—A force of men sent in to erect camp buildings and machinery for exploration work.

KERR LAKE (Cobalt)—Production in February amounted to 204,153 oz., as compared with 204,641 oz. in January.

LA ROSE CONSOLIDATED (Cobalt)—Shaft of Violet mine 425 ft. deep. Crosscut at 410 level cut four veins, one 6 in. wide, with low silver content. Discovery regarded as important.

PORT ARTHUR COPPER (Mine Centre)—Shaft 7 x 11 ft. down 135 ft. and drifting in progress at 100 level. Equipment comprises 100 hp. boiler, hoist capable of operation down to 600 ft. and 6-drill compressor plant.

LA ROSE CONSOLIDATED (Cobalt)—Main La Rose dumps all milled, but limited tonnage remaining adjacent to main shaft; also considerable concentrating ore at the Princess and Lawson mines, but no accurate estimates possible.

PATRICIA (Boston Creek)—Work begun on foundation for Hardinge mill with a capacity of 40 to 50 tons daily. Shaft nearing 150-ft. level. The average width of vein between 25 and 30 in., with good grade of ore.

ASSOCIATED GOLDFIELDS (Larder Lake)—Main workings reached a depth 500 ft. Shaft stated to be in ore of commercial grade all the way. At 100 level orebody is 130 ft. wide. Crosscutting to be undertaken at the 500 level. Working force to be increased to 150 men.

ELLIOTT-KIRKLAND (Kirkland Lake)—Developments at 400 level show a decrease of mineralization as compared with the 200 level. A wide orebody has been cut; some parts show good gold content; but a consistent occurrence of commercial ore not yet proved. Drifting continued in hope of higher-grade ore.

COPPER CREEK ALTA MINING (Edmonton)—Company organized and capitalized at $200,000, for development of copper mine in the Kamloops district, B. C. Formerly owned by Tenderfoot Mining Co., which was unsuccessful for lack of shipping facilities. The Canadian Northern main line now runs through property. O. J. Gould, of Edmonton, is president, and Dr. C. W. Field, vice president.

MEXICO

Baja California

COMPAGNIE DU BOLEO (Santa Rosalia)—Copper produced in February, 1,576,400 lb.

The Market Report

SILVER AND STERLING EXCHANGE

Mar.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Mar.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
21	4.7530	89⅞	44⅛	25	4.7530	92⅛	46
22	4.7530	90⅛	45	26	4.7530	92⅛	45⅛
23	4.7530	92⅛	46	27	4.7530	92⅛	45⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Mar.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
21	*23½	†	7⅛ @7⅛ 7.10	7.00 @7.10 7.00	7.10 @7.15 7.12½
22	*23½	†	@7.25 7.10	@7.05	@7.15 7.10
23	*23½	†	@7.25 7.05	7.00	@7.15 7.10
25	*23½	†	@7.25 7.05	7.00	@7.15 7.00
26	*23½	†	@7.25 7.05	7.00	@7.10 6.95
27	*23½	†	@7.25	7.00	@7.00

* Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917.

† No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 17.5c. per 100 lb. above St. Louis.

Some current freight rates on metals per 100 lb. are: St. Louis-New York 17c.; St. Louis-Chicago, 13c.; St. Louis-Pittsburgh, 13.1 cents.

LONDON

Mar.	Copper Standard Spot	Copper Standard 3 Mos.	Copper Electrolytic	Tin Spot	Tin 3 Mos.	Lead Spot	Zinc Spot
21	110	110	125	318	318	29½	54
22	110	110	125	318	318	29½	54
23							
25	110	110	125	316	316	29½	54
26	110	110	125	316	316	29½	54
27	110	110	125	316	316	29½	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb. For convenience in comparison of London prices, in pounds sterling per 2,240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at $4.7515. £29½ = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1513c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

Metal Markets

NEW YORK—Mar. 27, 1918

Another week has passed without any features of special interest in the metal markets.

Copper—The difficulties of the refiners are gradually diminishing. Supplies of blister copper are being received more freely.

Copper Sheets are quoted at 31½c. per lb., f.o.b. mill, for hot rolled, and 1c. higher for cold rolled. Copper wire is quoted at 26½c. f.o.b. mill, carload lots.

Tin—There is no change in the situation. Some business in metal of 99% grade, spot, was reported done at 85@87c.

Ricard & Freiwald, of London, under date of Feb. 28, 1918, publish the following statistics of the tin market: Total stocks in London and other parts of United Kingdom, 2685 tons; landing and in transit, 554 tons, spot and landing tin in the United States, 197 tons; monthly deliveries in America, exclusive of Pacific ports, 1850 tons.

Lead—Again there was considerable confusion in this market, especially as to New York. There is no doubt about the St. Louis market settling down to a basis of 7c., there being a turnover of considerable proportions at that price. In New York transactions were light and were reported at prices ranging from 7.25c. down to 7.15c. In the latter part of the week there were offerings as low as 7.05c. In some quarters deliveries by the railways were reported being much more free, while from other quarters there were well-authenticated reports of spot and prompt lead still realizing a premium. There were some sizable inquiries for lead for export, while, on the other hand, domestic inquiries were reported very light. The smelting plant of the St. Joseph Lead Co. is still closed down owing to the strike.

Zinc—Business in lots of 100 to 200 tons was done from day to day, more being reported in the earlier part of the week than in the later, which probably accounts for the relative firmness of the market in the former period. Since Monday the market declined and at the close spelter was freely offered at 7c.

Zinc Sheets—$15 per 100 lb., unchanged.

Other Metals

Aluminum—No price other than the Government price of 32c. per lb. is quoted. Some sales of small lots at slightly greater prices than the Government; no large quantities handled; market is quiet.

Antimony—This market is again weaker. We quote spot at 12¾@13c., with only small business alone. We quote futures at 12c., c.i.f., in bond.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.35 per lb. for wholesale lots—500 lb. and over. The market is quiet.

Cadmium—This metal is quoted at $1.40 per lb.

Nickel—Steady at 50c. per lb., premium of 5c. per lb. for electrolytic.

Quicksilver—There is much uncertainty in this market, especially with respect to Governmental action. Anyhow, the market was decidedly firmer this week, and we quote $125.

Gold, Silver and Platinum

Gold—A decree issued Mar. 24 prohibits the exportation of gold in bars and of Mexican and foreign gold coins. According to the "New York Tribune," it provides for the exportation of gold and silver bullion by special permit in each case. As to the exportation of ore and concentrates containing gold and silver, the decree issued in September is still in effect.

Silver pesos may be exported, by special permit in each case, if gold to the same value is imported in return. The decree exempts gold in bars and national and foreign gold coins from consular fees, and it does not require consular invoices.

Silver—Owing to short supplies on London market, there has been in the last three weeks an advance of 3½ d. per oz. in bar silver from 42½ to 46d. The market closes easier with buyers satisfied at the higher prices.

Mexican Dollars at New York: Mar. 21, 72⅜; Mar. 22, 73½; Mar. 23, 74½; Mar. 25, 74½; Mar. 26, 74; Mar. 27, 74.

Platinum—Quoted nominally at $108. Our report last week read, "The last sales made in the free market were $103 per oz." There was a typographical error in this, it being intended to say $108 per oz.

Palladium—This market is still stronger, and we quote $145@150.

Zinc and Lead Ore Markets

Joplin, Mo., Mar. 23—Blende, per ton, high, $64.60; basis 60% Zn, premium, $62.50@57.50; medium to low, $50@45; calamine, per ton, 40% Zn, $35; average selling prices: blende, $55.17; calamine, $37.15; all ores, $54.25 per ton.

Lead: high, $87.50; basis 80% Pb, $86 @85; average selling price, all grades of lead, $84.86 per ton.

Shipments the week: Blende, 9920; calamine, 478; lead, 1921 tons. Value, all ores the week, $728,640.

It was a week of rumors. That the Carondalet smelter closed was confirmed. That the Bilharz mines closed was confirmed. That the Golden Rod mines closed, and that the Eagle-Picher Lead Co. quit night work are both emphatically denied. Five other mines in Oklahoma reported closed could not be reached, phone lines proving ineffective.

Platteville, Wis., Mar. 23—(By telegraph)—Blende, basis 60% Zn, $58 base for premium grade down to $48 base for second grade. Lead ore, basis 80% Pb, $85 per ton. Shipments reported for the week were: 2607 tons blende and 2268 tons sulphur ore. For the year to date the totals are 26.643 tons blende, 1017 tons galena and 9660 tons of sulphur ore. During the week 3180 tons of blende was shipped to separating plants.

Other Ores

Antimony Ore—Small business was reported done at about $1.75 per unit.

Chrome Ore—Charles Hardy reports business in 40@43% done at $1.50 per unit, delivered at New York, and says that high-grade ore is offered at $1.50@2 at shipping point, but that very little 50% ore is available.

Manganese Ore—Schedule price remains at $1.20 per unit for 48% grade and upward, but arrivals have fetched as high as $1.35, New York. We quote the market at $1.20@1.35.

Molybdenite—Small business was reported at $1.85 for ore of 90% grade, and $1.80 for 85% grade. It was hard to find buyers for the lower grade.

Pyrites—Spanish lump is quoted at 17c. per unit, on basis of 10s. ocean freight, buyer to pay excess freight and war risk, except that, depending on conditions, concession of 2% of war risk may be allowed. Importations are to continue as usual up to April 15. After that date no licenses for importations are likely to be issued. It is probable that the Government will control the importations after the date mentioned and will distribute the imported pyrites to those most in need of it.

Tungsten Ore—There were rather large transactions this week, and high-grade ore was especially in demand. We quote scheelite at $24@24.50, and wolframite at $19@24, according to grade, high-grade ore being firm, while low-grade was a little easier. The quotation of $19 represents ore of 60% grade.

Iron Trade Review

PITTSBURGH—Mar. 26

Business men are following very closely events in the German drive on the British front, but are not allowing their interest to interfere with business, which is not

disturbed by the news. The condition of relatively small commercial demand for steel continues, but there is demand for products such as small spikes and oil-country goods. Some plate mills report a good demand for plates for commercial purposes, including tank construction in particular.

Business has not been interfered with by the tendency of price readjustment. Official announcement has not yet been made as to prices to rule after Mar. 31, although an announcement is expected daily. Unofficial reports are that basic iron is to be reduced $1 to $32, bessemer being kept 10% above basic, which would make it $35.20, and scrap to be reduced about $1 per ton. There are no definite reports that finished-steel prices will be altered. Prices may be named to run only to June 30, and if so the War Industries Board may insist upon reductions at that time.

Shipments of finished steel continue to increase and in some cases are approximately equal to capacity, but as a rule stocks, which had become uncomfortably large, are being reduced and production has not increased as much as shipments. Some mills have much better shipping conditions than others, partly on account of varying railroad conditions and partly because some products are accorded preference as being war essentials.

With an almost continuous increase in Connellsville coke shipments, and nearly full coal supplies at byproduct ovens, the blast furnaces are in much better position and can easily make pig iron for all the finished steel that can be shipped. Pig-iron production this week is at a rate of more than 35,000,000 tons a year, having dropped to well below 30,000,000 tons in some weeks of January and February. Production in 1917 is now officially reported at 38,647,397 tons, against 39,434,797 tons in 1916, a decrease of 2%. Production of steel ingots in 1917 was about 42,200,000 tons, an increase of about 2%. The divergence was due chiefly to the absorption of pig-iron stocks in 1917.

Pig Iron—Merchant furnaces are operating at about 85% of capacity, against about 80% early in March and an average under 60% in January and February. Pig iron still seems scarce, nevertheless. Furnaces are making up arrears in shipments and have scarcely any prompt iron to offer, but usually take care of pressing needs of regular customers. Prices hitherto in force, but which may be revised this week, are: Bessemer, $36.30; basic and No. 2 foundry, $33; malleable, $33.50; forge, $32, f.o.b. furnace, freight to Pittsburgh in the case of the Valley furnaces being 95c.

Steel—There continues to be considerable inquiry for soft steel in the form of billets, slabs and sheet bars, with scarcely any offerings. Demand for shell discard steel is increasing and prices are somewhat firmer, some sales being reported at close to the soft steel limits, which remain: Billets, $47.50; small billets, $51; slabs, $50; sheet bars, $51; rods, $57.

Sheet and Tin Plate Prices—The bi-monthly wage adjustment showed the average price realized on 26 - 27- and 28-gage sheets shipped in January and February to have been 5.35c., against 5.50c. in November and December, a market price of 8c. to 9c. for many months prior to the price fixing, and 5c. as the fixed price. Tin plate averaged $8.40, against $8.60 in the former period, the set price being $7.75.

Ferroalloys

Ferromanganese—Shading of the regular quotation of $250 has cropped out again, but appears to be only $1 or $2 a ton. Production in 1917, as just officially reported, was 286,000 tons, against 221,532 tons in 1916. Manganese ore imports were 629,972 tons, against 576,321 tons in 1916.

Coke

Connellsville—Car supplies continue insufficient, but generally improve slightly from one week to the next. Last week's shipments are estimated at about 350,000 tons, against 335,000 tons in each of the two weeks preceding, and less than 300,000 tons in each previous week of the year. Conditions as to car supplies are only fair this week. Coke once loaded gets through to destination without much difficulty, except that the Pennsylvania much of the time restricts shipments east to ovens in the upper part of the region to one-half the total daily shipments. Foundry coke is being offered more freely, but is still far short of demand. Some old dumps in the region are being culled for screenings, which bring $5.50 for salamander and other fuel purposes. Set price limits remain: Furnace, $6; foundry, 72-hour selected, $7; crushed, over 1-in., $7.30, per net ton at ovens.

STOCK QUOTATIONS

N. Y. EXCH.†	Mar. 26
Alaska Gold M	1⅛
Alaska Juneau	1⅛
Am.Sm.& Ref.,com.	77
Am. Sm. & Ref., pf.	104½
Am. Sm. Sec., pf., A	90
Am. Zinc	12½
Am. Zinc, pf	49
Anaconda	62⅛
Batopilas Min	1
Bethlehem Steel	78½
Bethlehem Steel, pf.	89
Butte & Superior	19
Butte Cop. & Zinc	9½
Cerro de Pasco	30½
Chile Cop	15
Chino	40½
Colo. Fuel & Iron	37⅛
Crucible Steel	62
Crucible Steel, pf	‡86
Dome Mines	8⅛
Federal M. & S.	9
Federal M. & S., pf.	30⅛
Great Nor., ore ctf.	26⅜
Greene Cananea	39
Gulf States Steel	89
Homestake	76
Inspiration Con	45
International Nickel	27⅞
Kennecott	30⅛
Lackawanna Steel	76
Mexican Petrol	92⅛
Miami Copper	30⅜
Nat'l Lead, com	56
National Lead, pf	100
Nev. Consol	18⅛
Ontario Min	7
Ray Con	22⅛
Republic I.&S.,com.	77¼
Republic I. & S., pf.	97⅛
Sloss-Sheffield	51
Tennessee C. & C.	15⅛
U. S. Steel, com	88⅛
U. S. Steel, pf	109
Utah Copper	78⅛
Va. Iron C. & C	67

N. Y. CURB†	Mar. 26
Big Ledge	1 7/8
Butte & N. Y	‡1
Butte Detroit	⅞
Caledonia	.42
Calumet & Jerome	1⅛
Can. Cop. Corpn	1⅛
Carlisle	‡2
Cashboy	11½
Con. Ariz. Sm	2
Con. Coppermines	5⅛
Con. Nev.-Utah	‡⅛
Emma Con	.25
First Nat. Cop	‡2
Goldfield Con	28⅛
Goldfield Merger	‡.04½
Greenmonster	‡.75
Hecla Min	4⅛
Howe Sound	‡4½
Jerome Verde	⅛
Kerr Lake	5.10
Louisiana	‡.50
Magma	‡37
Majestic	‡.31
Marsh	.06
McKinley-Dar-Sa	.43
Milford	‡1½
Mohican	‡.25
Mother Lode	.37½
N. Y. & Hond	‡12½
Nipissing Mines	8⅛
Nixon Nevada	1⅛
Ohio Cop	⅛
Rawley	2¼
Ray Hercules	4⅛
Richmond	‡.56
Rochester Mines	.32
St. Joseph Lead	15
Standard S. L	.40½
Stewart	.25
Success	.13
Tonopah	‡3⅛
Tonopah Ex	1⅛
Tribullion	‡.31
Troy Arizona	‡.18
United Cop	‡⅞
United Verde Ext	37
United Zinc	‡2½
Utica Mines	‡.08

SAN FRAN.*	Mar. 26
Alta	.03
Andes	.16
Best & Belcher	.02
Caledonia	.06
Challenge Con	.02
Confidence	.04
Con. Virginia	.31
Gould & Curry	.01
Hale & Norcross	.02
Jacket-Cr. Pt	.07
Mexican	.14
Occidental	‡.60
Ophir	.11
Overman	.02
Savage	.03
Sierra Nevada	.13
Union Con	.99
Utah Con	‡.01
Belmont	3.00
Jim Butler	.59
MacNamara	.11
Midway	.07
Mont.-Tonopah	.11
North Star	.04
Rescue Eula	.08
West End Con	.77
Atlanta	.10
Booth	.05
Comb. Frac	‡.02
D' eid Daisy	‡.02
Florence	.12
Jumbo Extension	.13
Kewanas	.06
Nevada Hills	.03
Nevada Packard	‡.25
Round Mountain	.32
Silver Pick	.04
White Caps	.44
Big Jim	‡.75
United Eastern	4.62½

BOSTON EXCH.*	Mar. 26
Adventure	1
Ahmeek	79½
Algomah	.25
Allouez	50
Ariz. Com., ctfs	12½
Arnold	.20
Bonanza	.22
Butte-Balakiava	.25
Calumet & Ariz	67
Calumet & Hecla	430
Centennial	13½
Copper Range	44
Daly West	1⅛
Davis-Daly	5⅛
East Butte	9½
Franklin	5½
Granby	75
Hancock	8
Hedley	12
Helvetia	.15
Indiana	.50
Isle Royale	21½
Keweenaw	1⅞
Lake	5⅛
La Salle	2¼
Mason Valley	4⅛
Mass	5⅛
Mayflower	.75
Michigan	1½
Mohawk	60½
New Arcadian	2
New Idria	16
North Butte	14½
North Lake	.70
Oilbway	1
Old Dominion	39½
Osceola	55½
Quincy	70
St. Mary's M. L.	‡51
Santa Fe	1
Seneca	8½
Shannon	4⅛
Shattuck-Ariz	16
So. Lake	1⅛
So. Utah	.11
Superior	4⅛
Superior & Bost	2½
Trinity	3⅛
Tuolumne	.93
U. S. Smelting	42½
U. S. Smelt'g, pf.	45
Utah Apex	2
Utah Con	9⅛
Utah Metal	2⅛
Victoria	2½
Winona	1⅛
Wolverine	28
Wyandot	.90

BOSTON CURB*	Mar. 26
Alaska Mines Corp	‡.20
Bingham Mines	‡9½
Boston Ely	.82
Boston & Mont	.52
Butte & Lon'n Dev	.19
Calaveras	1⅛
Calumet-Corbin	‡.01
Chief Con	2
Cortez	.10
Crown Reserve	.20
Crystal Cop	‡.52
Eagle & Blue Bell	2
Gila Copper	‡17
Houghton Copper	.75
Intermountain	‡.70
Iron Cap, Com	17½
Mexican Metals	.46
Mines of America	‡1⅛
Mojave Tungsten	.07
Nat. Zinc & Lead	.26
Nevada-Douglas	.80
New Baltic	.90
New Cornelia	16½
Oneco	.20
Pacific Mines	‡.35
Rex Cons	‡.10
Yukon Gold	1

SALT LAKE*	Mar. 25
Bannack	‡.26
Cardiff	4.25
Colorado Mining	.06½
Daly	1.30
Daly-Judge	5.75
Empire Copper	1.00
Gold Chain	.08
Grand Central	‡.35
Iron Blossom	.42
Lower Mammoth	‡.03
May Day	.02½
Moscow	‡.02
Prince Con	.52
Rico Wellington	.15
Silver-King Coal'n	1.90
Silver King Con	2.00
Sioux Con	.04
So. Hecla	.60
Tintic Standard	1.30
Uncle Sam	.00½
Walker Cop	1.52½
Wilbert	.11
Yankee	‡.05

TORONTO*	Mar. 25
Adanac	.08½
Bailey	.04½
Beaver Con	.26½
Chambers Ferland	.20
Coniagas	3.05
Hargraves	.07
La Rose	.63½
Peterson Lake	.09
Temiskaming	.26
Wettlaufer-Lor	.05
Davidson	.34½
Dome Exten	.09½
Dome Lake	.24
Hollinger	5.10
McIntyre	1.36
Newray	.18
Porcu. Crown	.16
Teck-Hughes	.49
Vipond	.20
West Dome	.13

STOCK QUOTATIONS—Continued

COLO. SPRINGS	Mar. 26
Cresson Con	4.43⅜
Doctor Jack Pot	.03½
Elkton Con	.04¼
El Paso	.12
Gold Sovereign	‡.02
Golden Cycle	1.57½
Granite	.30
Isabella	.05½
Mary McKinney	.05¼
Portland	.95
United Gold M	.15
Vindicator	.30

LONDON	Mar. 11
Alaska G. F	£) 16s 6d
Burma Corp	4 5 7½
Cam & Motor	0 11 6
Camp Bird	0 8 0
El Oro	0 9 9
Esperanza	0 9 9
Mexican Mines	5 12 6
Min. Corp. Can	0 16 3
Nechi, pfd	0 11 0
Oroville	0 19 9
Santa Gert'dis	0 13 6
Tomboy	0 19 0

* Bid prices. † Closing prices. ‡ Last Quotations.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1916	1917	1918	1916	1917	1918
Jan.	56.775	75.630	88.702	26.960	36.682	44.356
Feb.	56.755	77.585	85.716	26.975	37.742	42.792
Mar.	57.935	73.861		27.597	36.410	
April	64.415	73.875		30.662	36.963	
May	74.269	74.745		35.477	37.940	
June	65.024	76.971		31.060	39.065	
July	62.940	79.010		30.000	40.110	
Aug	66.083	85.407		31.498	43.418	
Sept	68.515	100.740		32.584	50.920	
Oct	67.855	87.332		32.361	44.324	
Nov	71.604	85.891		34.192	43.584	
Dec	75.765	85.960		36.410	43.052	
Year	65.661	81.417		31.315	40.851	

New York quotations cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1917	1918	1917	1918	1917	1918
Jan.	28.673	23.500	131.921	110.000	142.895	125.000
Feb.	31.750	23.500	137.895	110.000	148.100	125.000
Mar.	31.481		136.750		151.000	
April	27.935		133.842		147.158	
May	28.788		130.000		142.000	
June	29.962		130.000		142.000	
July	26.620		128.409		140.409	
Aug	25.380		122.391		137.000	
Sept	25.073		117.500		135.250	
Oct	23.500		110.000		125.000	
Nov	23.500		110.000		125.000	
Dec	23.500		110.000		125.000	
Year	27.180		124.892		138.401	

Tin	New York		London	
	1917	1918	1917	1918
January	44.175	85.500	185.813	293.227
February	51.420	92.000	198.974	311.525
March	54.388		207.443	
April	55.910		220.171	
May	63.173		245.114	
June	62.053		242.083	
July	62.570		242.181	
August	62.681		243.978	
September	61.542		244.038	
October	61.851		247.467	
November	74.740		274.943	
December	87.120		298.556	
Av. year	61.802		237.563	

Lead	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	7.626	6.782	7.520	6 684	30.500	29.50
February	8.636	6.973	8.595	6.899	30.500	29.50
March	9.199		9.120		30.500	
April	9.288		9.158		30.500	
May	10.207		10.202		30.500	
June	11.171		11.123		30.500	
July	10.710		10.644		30.500	
August	10.594		10.518		30.500	
September	8.680		8.611		30.500	
October	6.710		6.650		30.500	
November	6.249		6.187		30.500	
December	6.375		6.312		30.500	
Year	8.787		8.721		30.500	

Spelter	New York		St. Louis		London	
	1917	1918	1917	1918	1917	1918
January	9.619	7 836	9.449	7.661	48.329	54.000
February	10.045	7.814	9.875	7.639	47.000	54.000
March	10.300		10.130		47.000	
April	9.459		9.289		54.632	
May	9.362		9.192		54.000	
June	9.371		9.201		54.000	
July	8.643		8.473		54.000	
August	8.360		8.190		54.000	
September	8.136		7.966		54.000	
October	7.982		7.812		54.000	
November	7.847		7.672		54.000	
December	7.685		7.510		54.000	
Year	8.901		8.813		52.413	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1917	1918	1917	1918	1917	1918
January	$35.95	$37.25	$30.95	$33.95	$30.95	$33.95
February	36.37	37.25	30.95	33.95	30.95	33.95
March	37		33.49		35.91	
April	42		38.90		40.06	
May	45.9		42.84		43.60	
June	54.22		50.05		50.14	
July	57.45		53.80		53.95	
August	54.17		50.37		53.95	
September	46.40		42.24		48.58	
October	37.25		33.95		33.95	
November	37.25		33.95		33.95	
December	37.25		33.95		33.95	
Year	$43.57		$39.62		$40.83	

‡ As reported by W. P. Snyder & Co.